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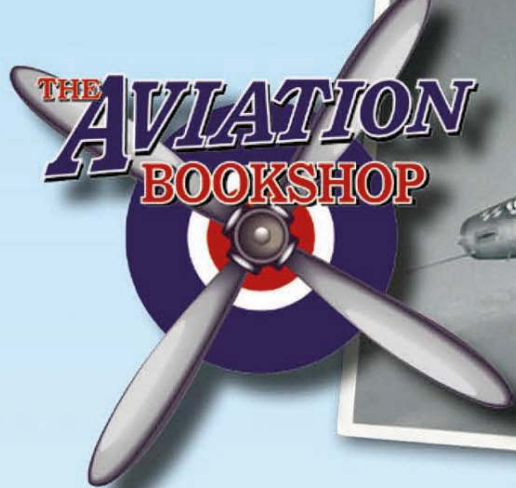


CHARMING THE SNAKE

AIRACOBRA: FROM RAF REJECT TO SOVIET HERO

ISSUE
30





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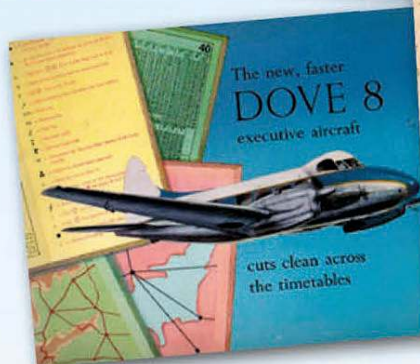
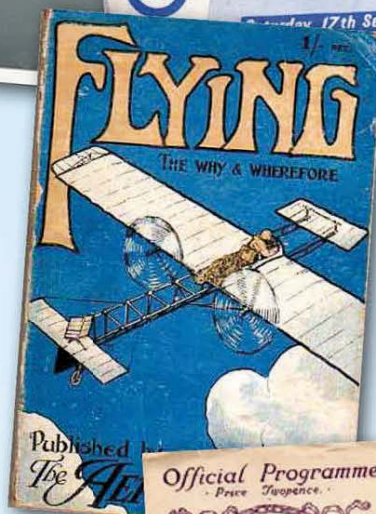
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The modern journal of classic aeroplanes and the history of flying

Editor's Letter

FIRST, A VERY happy new year to all our readers — from longstanding *TAH* veterans who have been with us since the beginning, to those who have joined us more recently. Without your support, involvement and encouragement, we simply couldn't continue to provide the most in-depth, wide-ranging and (we hope) entertaining and informative material available in the field of aviation history.

It is with a pleasing symmetry of round numbers that we launch into 2020 with Issue No 30 (despite it containing a decidedly non-symmetrical 13 main features!). A more unfortunate round number addressed within this issue is the 50th anniversary of the final collapse of the once-unassailable Handley Page company, which, after more than a decade of resistance to "industry rationalisation" — or government meddling, depending on your perspective — finally ceased trading under Sir Frederick's name in March 1970. Starting on page 10, Prof Keith Hayward FRAeS does his usual sterling job of mining the archives for first-hand accounts of a battle for the heart and soul of Britain's post-war aircraft industry.

On the subject of pioneers, this issue also sees the launch of a new series on France's early aviation personalities, those "*hommes* (often not so) *magnifiques*", who risked their necks, financially and literally, to pursue their passion to unlock the secrets of aerial navigation. In the first part of his series in this issue, French aviation historian Jean-Christophe Carbonel takes a look at the work of Antoine Filippi, inventor of the "*Cyrnos*" rotating wing in 1906. It ultimately proved to be a dead end, but the story of Filippi (and his equally determined countrymen) is charmingly representative of France's *époque de l'aviation héroïque* — a hot-house of imaginative, if not always innovative, thinking. I hope you enjoy the series.

Before we head into the issue, another quick reminder about the *TAH* index, the key to all 30 issues, available as a completely FREE PDF download on the *TAH* website — just look for the "Index" tab on www.theaviationhistorian.com.

FRONT COVER *Bell P-39 Airacobra Mk I AH621 was one of many rejected by the RAF and sent to fight with the Soviet Air Force. See page 18 for Dan Zamansky's article on why.* PHILIP JARRETT COLLECTION

BACK COVER *The Tupolev Tu-104A was known as the "Brontosaurus" in Czechoslovakian service. See pages 50–61.* VIA MIROSLAV JINDRA

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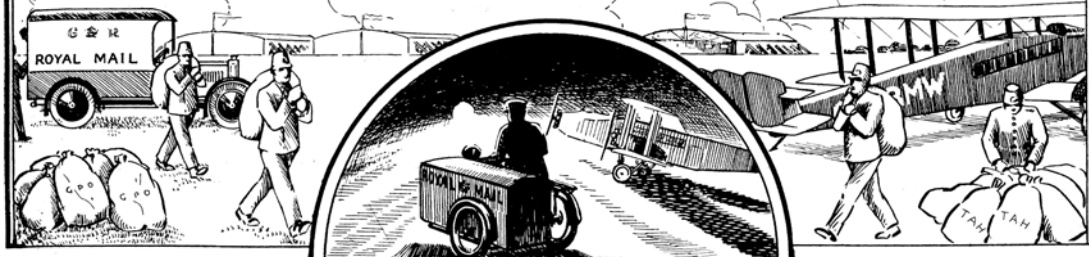
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AIR CORRESPONDENCE



Letters to the Editor

Fighter misin-formation?

SIR — Whilst I am admiring of Greg Baughen's books, and of his articles in *TAH*, and am impressed by the clarity and impact of his analysis, I find it necessary to quibble over the caption on page 12 of *TAH29*, in his article 1939: *Was the RAF Ready for War?* Those Hurricanes of No 111 Sqn are flying in echelon port, not in finger four. In 1938 RAF Fighter Command flew in vics as its tactical formation, and often assumed echelon formation for air to air photography, as here. Finger four is quite different from echelon, although both shared commonality in being four-aircraft formations in some kind of staggered line abreast. It would not be until late 1940 that finger four was adopted by some early-adopter RAF fighter units, and not until 1943-odd that it became the default RAF fighter formation.

Yours pedantically,

Anthony Cooper Brisbane, Queensland, Australia

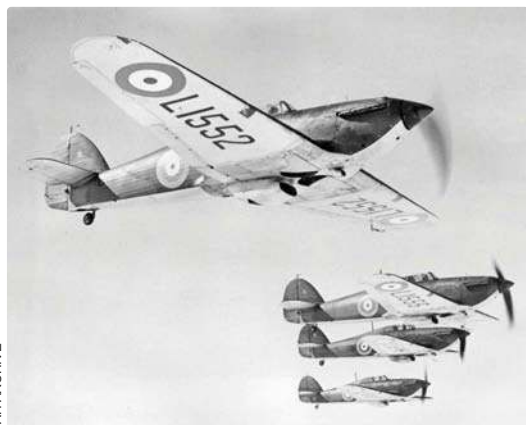
[Actually we wrote that caption, not Greg; and we disagree that the image shows the Hurricanes in echelon — if it did, all the propellers' spinners would line up with each other. However, on reflection neither is it a true finger four; if it were, then the aircraft nearest the camera would

be further to the left of the image. You make a good point about finger four not being widely adopted by the RAF until later in the war; but it would be very interesting to know (a) when finger four first appeared in Air Publication 129: RAF Flying Training Manual or similar training guides; and (b) when and where the formation originated: Luftwaffe in the Spanish Civil War? The Finnish Air Force in the mid-1930s? If anyone among TAH's readership can provide a definitive answer, let's hear it! — Ed.]

That migratory Moth

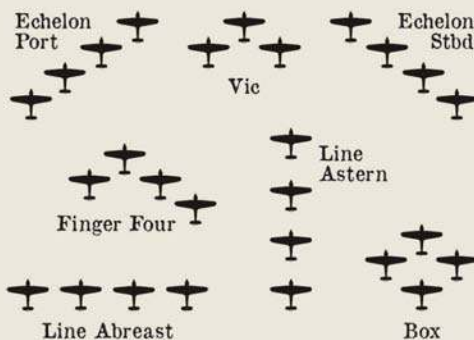
SIR — In response to Philip Jarrett's query about de Havilland Puss Moth G-AAZX in the Balkans in *Lost & Found* in *TAH17*, I can offer the following information.

Vickers (Aviation) Ltd had acquired 'ZX (c/n 2101), in November 1930 to act as a general communications machine, but reports fed back to the pilots' office were critical of the take-off performance, which was attributed to the propeller, a standard de Havilland DH5212/D75, optimised for the Gipsy III engine and airframe combination. Vickers designed a new propeller, 2in greater in diameter at 6ft 5in, but of a reduced pitch, 4-65ft against 5-41ft.



TAH ARCHIVE

RAF Fighter Formations



ABOVE Finger four, echelon or what? The Hurricane formation photograph which Anthony Cooper questions in his letter on this page. **ABOVE RIGHT** A selection of standard formations used by RAF aircraft in World War Two.

Comparative trials were flown by test pilot Mutt Summers on September 15 from the company airfield at Brooklands when, with pilot and passenger and 18gal of petrol on board, G-AAZX performed several take-offs, a climb to 4,000ft at 75 m.p.h., and level speed runs. As might have been expected, the finer-pitch Vickers propeller reduced the take-off time (by 26 per cent, about 3sec), and, although the ground temperature had increased when the de Havilland propeller was flown as a comparison, the time to 4,000ft of 6min 14sec against 6min 43sec showed an improvement of 7.5 per cent.

Richard Clarkson at Stag Lane would have taken careful note as he was meticulous over the company's choice of propeller, many of which he had designed himself; but there is no evidence to suggest that, as a result of the trials, there was any collaboration with Vickers. However, probably as a matter of routine, on November 5, simultaneous take-off trials were conducted at Hatfield between a Puss Moth fitted with a DH5180/13 propeller, the same blade used by Lois Butler when flying in the 1930 King's Cup Air Race, and what was described as "a blind flying aircraft". Richard Clarkson noted: "quite definitely better acceleration along the ground".

In August 1934 G-AAZX was sold to the Standard Telephones and Cable Co, based at Hatfield and replacing Tiger Moth G-ABRB, although it is believed it had been employed by the Standard company since 1932. The Puss Moth was fitted out for use as an experimental platform/travelling showroom, and the intensity of its schedule was explained in a letter of appreciation to, and later published by, its manufacturer. The Standard company's Radio Manager, Mr D.B. Mirk, explained

that on extended tours of an average of 25-40 flying hours, the aircraft, of necessity, spent comparatively long periods without expert attention, but neither airframe nor engine defects had ever interfered with the flying programme.

"Our aeroplane, G-AAZX, with a crew of two, 100lb of luggage and 150lb of radio demonstration apparatus, has returned to London after two months' cruise of Central Europe and the Balkans involving some 75 hours flying time, often for days on end at a shade temperature of about 95° F. The only attention given to the engine by the crew (who are radio engineers and not specially skilled in aircraft maintenance) was that specified in the instruction book."

By April 1938 G-AAZX was employed on air-survey activities from Southampton until it was impressed as X9401 in April 1940. The aircraft ended its days as an Instructional Airframe, 2304M, at No 12 School of Technical Training at Melksham in Wiltshire.

Stuart McKay MBE *Secretary, de Havilland Moth Club, Berkhamsted, Hertfordshire*

Uncertain steps in wing design

SIR — While I can't answer Philip Jarrett's question regarding which of the two pilots had flown the "Gramatescue" (*Lost & Found*, TAH29), I can provide a little more detail regarding the aircraft and designer.

The designer was named George Gramatesco, with a final "o" and not "u", as shown on the postcard image of the monoplane and in patents.

Gramatesco patented his aerofoil design in Britain, France, Switzerland and Germany between 1912 and 1914 based on the theory that the separation of the airflow at the discontinuity

Stuart McKay from the de Havilland Moth Club has provided some background about why D.H.80A Puss Moth G-AAZX was in Serbia in the mid-1930s — see his letter on this page.



VIS REVISITED More images of the Allies' Adriatic eyrie

IN *TAH12* CONSOLIDATED B-24 Liberator specialist Bob Livingstone chronicled Allied use of the island of Vis, off the coast of Yugoslavia in the Adriatic Sea, as a location for a vitally important emergency airfield during World War Two. Subsequently Rome-based *TAH* Editorial Board member Gregory Alegi sent us some additional photographs taken on that "rocky, waterless crag" with its short and primitive runway, which we present here.



ABOVE B-24 V Grand, the 5,000th Consolidated-built example, runs-up after an engine change by the USAAF's 81st Air Service Sqn in November 1944. **ABOVE RIGHT** An unidentified B-24 undergoes engine work on Vis.



MAIN IMAGE Lockheed P-38J-15-LO Lightning 43-28266 Loretta of the 14th Fighter Group being recovered by crane after running off the end of Vis's 3,500ft gravel runway. **INSET** Supplies — apparently including boxes of photographic glass plates — being unloaded from a USAAF Douglas C-47 on Vis.



would cause it to impact on the following section, or secondary wing behind [see *cleaned-up patent illustration on this page* — Ed.], thus enhancing lift. He may have been mistaken!

There is one more point. Sydney Pickles had a bad accident in September 1913 and was unable to resume flying until April 1914. At that point he said (in *Flight* of April 25, 1914) that he did not intend to resume professional flying but would continue with "recreational" flying. By June, however, he had entered for the Circuit of Britain race, which is a curious definition of recreational.

My money would be on Prodder as most likely to have flown the Gramaticesco. Given Pickles's statement about restricting his activities to recreational, I would see him as less likely to have travelled to France to test a somewhat dodgy-looking machine.

Ralph Pegram Fleet, Hampshire

[Philip Jarrett responds:

"Thanks to Ralph for the contribution, but Pickles obviously returned to professional flying rather sooner than he perhaps originally anticipated, so it is clearly wrong to rule him out as the possible pilot of the Gramaticesco. Also, a great many of the aeroplanes of the period would be regarded as 'somewhat dodgy-looking' to modern eyes — there were a lot that looked far 'dodgier' than this one!"

Terminological tussles

SIR — I don't think I'm an aviation snob, but I must confess that reading Adrian Roberts's letter in *TAH28* (headed "Really most awfully vulgar") made my toes curl, as I agree with him and Bob Livingstone entirely about use of the word "plane" in the context to which they refer.

Indeed, my reading of Adrian's letter was timely and coincidental, for the day before I had been in contact with my good friend Mark Nelson in Sydney. With our day-job hats on, Mark and I have worked together on the production of some 150 aviation books over the past few years for and on behalf of publishers and authors all over the world. I wear the editorial hat, and Mark wears the design hat, but Mark is an aviation enthusiast as well as a designer.

While working on a recent book project, an old chestnut fell out of the trees and it became the cause of some debate between Mark and me:

"port" and "starboard" engines . . . or "left" and "right" engines?

A few years ago I had my knuckles rapped twice over this for using the former; on one occasion it was by an engineer and on the other by a well-known author/enthusiast of some repute. I was reprimanded quite firmly along the lines of "NEVER use port/starboard, man!

An aeroplane is not a ship! And anyway, foreigners may not understand port or starboard. ALWAYS use right and left". Their words have kind of stuck with me ever since.

However, Mark commented, quite justifiably, that "the RAF combat reports quoted in the book use the terms 'port' and 'starboard' to describe which engine they have hit". Furthermore, Mark e-mailed me to say, "I spoke to a few old pilots today as it got my interest. One is an ex-RAF jet pilot from the 1960s, and he says 'port' and 'starboard'. I then spoke to another who learned to fly in Oz

in 1960, and 'port' and 'starboard' were being phased out [in favour of] left and right".

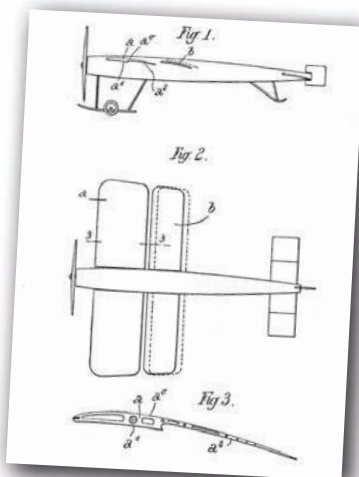
So, is this a case of the "scientific" clashing with established aeronautical vernacular? And which is "really" correct?

I would be interested to obtain your readers' views on this subject.

I won't even begin to ask whether an aircraft is "she" or "it" . . .

Robert Forsyth Ticehurst, East Sussex

"Port", "Starboard" and "It" are the correct forms — at least in any British-based aviation-history publication which seeks to cherish and perpetuate proper traditions, as we do here at TAH. My view has always been that "left" and "right" are open to misinterpretation — left or right from whose perspective? The pilot's, presumably. But what if the aeroplane is coming towards you? The starboard wing is then the left wing, right? So there's an ambiguity that is completely avoidable with the use of port and starboard. There can only be one port and one starboard. And Mark is quite right when he says the combat reports very often use the latter, presumably for the very reason I mention — it's unambiguous. Hence I'll be sticking with port and starboard. And what's wrong with nautical terms anyway — should we get rid of knots too? Pilot? Bulkhead? Galley? Trim? All originally nautical — Ed.]





Decline & Fall

Sir Frederick & the demise of Handley Page, 1960–70

50 years ago the last vestiges of the once-mighty Handley Page company, established by Sir Frederick Handley Page in 1909, went into liquidation, largely as a result of a decade of political wrangling and a reluctance by Sir Frederick to merge his illustrious company for the sake of government policy, as **Prof KEITH HAYWARD FRAeS** explains

SIR FREDERICK HANDLEY Page (FHP) was one of the most influential founders of the UK's aerospace industry; indeed, his eponymous company is recognised as being the first British company to be devoted solely to aviation. Its products included one of the world's first strategic bombers; a series of pioneering inter-war airliners; the wartime Halifax bomber and of course the innovative Victor nuclear "V-bomber". He was also a technical innovator, with several important aviation engineering patents to his name. In short, he was one of the great British "hero designers"; a group of original aerospace engineers who built manufacturing companies in their own names and whose presence continued to dominate the post-1945 industry.

By the late 1950s there were few of this ilk left in positions of real influence; but, in Sir Frederick's case, he still controlled his company

and resisted the government's attempts to force consolidation and rationalisation on the industry. However, his dogged opposition to the merger process contributed to the ultimate collapse of the business. The story of the decline and fall of the Handley Page company centres on the implementation of the "Two Group" policy formulated by Duncan Sandys as Minister of Aviation in 1960 as part of the merger process.

Handley Page vs Avro

Handley Page had tried to re-enter the civil market with its piston-engined Herald in the early 1950s. In 1954 a request from the manufacturer for government aid was turned down, as policy demanded that industry must finance its own airliner projects. Handley Page continued with its own money, achieving some success in overseas markets. However, by the late 1950s airline thinking had shifted towards turboprop-

OPPOSITE PAGE *Sir Frederick Handley Page CBE, one of Britain's great captains of industry, in the 1950s. Born in Cheltenham, Gloucestershire, on November 15, 1885, Frederick was a shrewd businessman and, reputedly, raised the capital for some of his early aviation experiments by playing poker on commuter trains into and out of London.*





ABOVE The most technologically ambitious — and arguably most attractive — of the RAF's V-bombers, Handley Page's futuristic Victor represented the cutting edge of bomber development in the late 1950s. The Armstrong Siddeley Sapphire-engined Victor B.1 entered operational service with No 10 Sqn at RAF Cottesmore in April 1958.

engined aircraft, and commercial interest in the Alvis Leonides-engined Herald began to wane. Handley Page's response was the Dart Herald, which flew for the first time in March 1958.¹

By this time, however, Handley Page was up against a strong domestic competitor in what was described as the search for a "Dakota replacement". Avro launched its 748 design in 1958, learning from both Handley Page's work and the Dutch Dart-powered Fokker F.27. The 748 concept was aimed specifically at operations from short or semi-prepared airfields. Although it was part of the Hawker Siddeley Group and able to draw upon the resources of the parent, Avro was still expected to operate as a separate enterprise.

While both Avro and Handley Page were confident that there was a large export market for their respective types, both were under

pressure to find the necessary funds to complete development. The two British state-run airlines, British European Airways (BEA) and the British Overseas Airways Corporation (BOAC), were not prepared to order a short-haul airliner, and neither design met the government's criteria for support for "technically advanced" concepts. Of the two designs, Ministry of Supply (MoS) officials felt that "the Herald had a slight edge", and if the target was defined primarily by "immediately challenging the Friendship, this overwhelmingly favours the Dart Herald".²

In May 1959 the Cabinet discussed the issue and referred it to the Committee on Civil Aviation Policy (CCAP). Harold Watkinson, the Minister of Transport & Civil Aviation, stated that it was up to BEA to decide whether it needed either aircraft. The Minister of Supply, Aubrey Jones, opined

The first production Dart Herald, G-APWA, resplendent in BEA's then-still-new red-and-black colour scheme at the SBAC show at Farnborough in September 1960. As part of its display, the Herald embarked 30 troops and took off in less than 600yd. TAH ARCHIVE





MIKE HOOKS

ABOVE In 1960 Handley Page built the decidedly odd-looking H.P.115, powered by a single Bristol Siddeley Viper engine, to investigate low-speed flight with a very slender delta wing for the nascent Concorde project. The sole example, XP841, performed at the 1961 SBAC show at Farnborough, where it is seen here before its display.

that if there were a choice, he preferred the 748, as it was to be built by a larger group and FHP was already a vocal opponent of rationalisation. In the event, the Cabinet decided that both should receive a modest amount of support.³

The reluctant suitor

The Conservative government had been nudging the aircraft industry towards rationalisation since 1955, but in the autumn of 1959 a financial crisis affecting several leading firms forced the government and the newly minted Minister of Aviation, Duncan Sandys, to take a more active and aggressive role in the process of rationalisation.⁴ Sandys opened his so-called "marriage bureau" to encourage, cajole or otherwise bully companies into one of the two groups favoured by the government. Compliance would be rewarded with access to launch subsidies for civil projects, and by government orders for military aircraft. The British Aircraft Corporation (BAC) and Hawker Siddeley Aviation (HSA) rapidly emerged as the basis of this "Two Group" policy. Sandys emphasised that henceforth all government orders, and those subject to governmental approval (such as for the nationalised airlines), would be placed with one of these groups.⁵

Denis Haviland, Sandys' lead official on the merger process, summed up the "marriage bureau" in a wry memorandum:

"The expression 'shotgun marriages' has been used in connection with the government's efforts to promote rationalisation within the industry.

The cynic might say these particular companies seem willing to wed providing the officiating minister promises them a dowry and a feather-bed. Personally, I regard it [as] wrong *in principle* for the government to be asked *as a condition* [emphases in original] of the merger to commit itself to a policy and courses of action which, however qualified, give the grouped companies some promise of a monopoly position.

"It seems to me to put the boot on the wrong foot. [The] government's policy should come first; mergers should follow as a consequence, which the companies voluntarily adopt in their commercial interests in order to put themselves in the best position to benefit from the workings of that policy."

In Haviland's view, mergers should not be conditional. But he did concede that it might be politic to hint that those companies that did sort themselves out were the most likely to win future contracts, and that it was not in government policy to extend orders (unless in special circumstances) to those "which have stood apart from the process of strengthening the industry".⁶

At the same time, other officials expressed "some disquiet" that several excellent design teams were outside the emerging groups. The government would not "discourage firms who managed to keep in business by virtue of their own enterprise and managerial skill, but in the absence of any special factors, they could not be assisted".⁷ Thus, while the "Two Group" policy towards the aircraft sector was non-negotiable, the Ministry of Aviation (MoA) was aware of the



ABOVE LEFT *Peter Thorneycroft, Minister of Aviation from July 1960 to July 1962. ABOVE CENTRE* *Geoffrey Rippon, who went on to become Shadow Secretary of State for Defence during 1969–70 and, briefly, Minister of Technology in 1970. ABOVE RIGHT* *Julian Amery, who took over from Thorneycroft as Minister of Aviation in 1962.*

need to include all of the key assets in the future structure. But resistance to the logic of the Two Group policy would be futile, a brutal fact that Sir Frederick would soon discover.⁸

HSA, DH and other loose ends

The formation of BAC, essentially a merger of English Electric and Vickers, was a process that had been under way since the joint award of the TSR.2 contract in 1958. The new group also absorbed Bristol and Hunting, an exercise that was generally straightforward. However, the consolidation of Hawker Siddeley as the second aircraft group, particularly regarding the treatment of Handley Page, illustrates the government's brutal application of the so-called Two Group policy.

Hawker Siddeley's response to the government's rationalisation policy was to apply a ruthless commercial approach. This included getting on top of the rather anarchic organisation of the Hawker Siddeley Group, pruning capacity and acquiring the more attractive bits of the industry left over after the formation of BAC. Hawker Siddeley rejected Bristol, but acquired Blackburn, along with its NA.39 (to become the Buccaneer) contract for the Fleet Air Arm. Hawker Siddeley was also keen to expand its civil competence, accomplished with the purchase of de Havilland early in 1960.

Handley Page, as the last remaining large independent aircraft company, was another tempting target. Sir Frederick had been unwilling to be drawn into Sandys' marriage bureau, but by 1960 his company was in play. Hawker Siddeley was interested, but, as with all its other mergers and acquisitions, it acted in a cold-blooded commercial fashion and was reluctant to guarantee the future of the Herald, then competing against the Hawker Siddeley (Avro) 748.⁹ Nevertheless, Sir

Frederick was prepared to recommend an offer of 16 shillings a share from Hawker Siddeley to his shareholders. Matters were complicated by the Air Ministry's decision to halve the RAF's Victor B.2 order, which led HSA to drop its bid to ten shillings a share. The new Minister of Aviation, Peter Thorneycroft (Sandys left the MoA in the summer of 1960), moved to give some help by raising the price of the Victor contract. But this was not enough to save the deal. Sir Frederick ended talks in July 1960.¹⁰ Thorneycroft wrote to Sir Frederick urging him to reconsider, but the latter's response was blunt and to the point:

"Our accountants felt that even with [the Victor] cancellation, 16 shillings was still a fair reflection of company value. Winding up the company would deliver most of our shareholders with a better return than ten shillings. We feel that the Minister would not want us to merge at a knockdown price."

Sir Frederick also asked for continued support from the government:

"We cannot allow the question of a merger to drag on any further, and unless the Ministry [of Aviation] can create conditions under which a merger is possible, we must conclude that a merger is impracticable. In the latter case we would wish to be assured of the continued support by the Ministry for any projects which we may submit."¹¹

This was overly sanguine; the government was not to be swayed from its commitment to focus orders on the new groups. Geoffrey Rippon, a junior minister in the MoA, wrote to FHP on September 15, 1960, stating that he could not intervene to improve Hawker Siddeley's offer. Companies who wished to stay outside the groups did so "on the basis of their own commercial judgment. In the view of the department, however, it would be sad if an



ABOVE In the late 1950s Handley Page was occupied not only with Herald and Victor production, but also research and design work on various projects, including the unbuilt twin-Bristol Orpheus-engined H.P.113 high-speed executive transport, incorporating scoop intakes in the rear fuselage and a complex boundary-layer-control system.

historic company like yours was to drop out of aviation". In respect of future support and orders, Rippon stated that "I can offer you no such assurance. It will be the duty of the Ministry to administer the government policy".¹²

There were further exchanges in this vein, with Thornycroft expressing his personal appreciation of Handley Page's contribution to the nation "since the early days of aviation" and for this reason urging amalgamation.¹³ It fell on deaf ears. Sir Frederick continued in his resolute opposition to a cheap merger, and indeed the need for consolidation at all; he publicly condemned the government's approach, countering that "the soul of a business lies in the creativeness of the individual, and that progress is not achieved by elephantine size or by soulless bureaucracy".¹⁴

While the company finally received some assistance for the Herald — mainly the cost of three "proving" aircraft for BEA and overseas marketing support — nothing of substance came its way. Indeed, Sir Frederick's suspicions about the Ministry's motives seem to have been well-founded. In November 1960 Thornycroft wrote to Lord Douglas of Kirtleside, BEA's Chairman, hinting that the Herald might be cancelled in favour of the 748 if the merger went ahead. Such an action, he argued, would improve the "UK competitive position if one of the two aircraft were cancelled".¹⁵

These manoeuvres led Sir Frederick to mount increasingly bitter attacks on the government and its Two Group policy; challenges that were not appreciated by the MoA. An internal note refers to FHP's "fictions" about resisting pressure to force him into a merger. The truth was that he was well aware of the "wisdom of joining a group".¹⁶

At the time of his "marriage bureau", Sandys had expressed an emotional commitment to Handley Page and had personally appealed

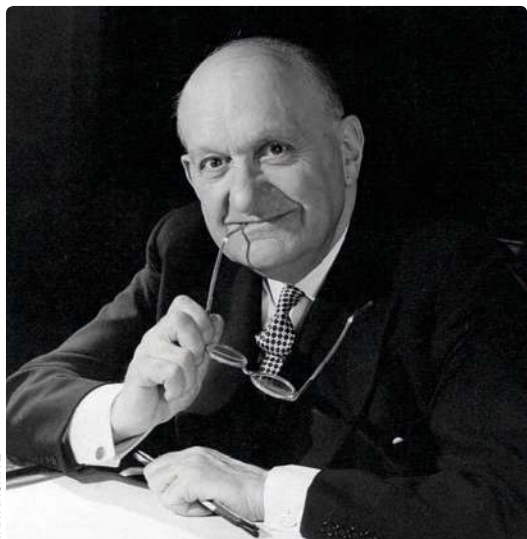
to Sir Tom Sopwith to make the initial offer. At the end of the merger process in 1960, the MoA still saw merit in the Victor programme "within one of the groups", but had wanted to eradicate "the unhealthy competition between the Herald and the 748". But Sir Frederick wanted more, and "procrastinated too long"; when the Victor contract was cut as an economy measure, the deal fell through.

Hawker Siddeley made several more offers, but "Handley Page . . . always held out for more". The former was still interested, but the financial positions of the two companies were such that "I shall be surprised if it is possible for them to reach a satisfactory arrangement".¹⁷

Death of a pioneer

Sir Frederick's death on April 21, 1962, ended much of the public recrimination and acrimony, but his company continued its slow and perhaps inevitable decline. Earlier that year, Handley Page had finally lost the key contract for the RAF's medium transport aircraft to HSA. Thornycroft told the House of Commons that the 748 had been chosen over the Herald "on merit", but that the decision had also been made for the "long-term health of the industry, despite some embarrassment about supporting the 748 over the 'private enterprise' Herald".¹⁸

In October 1963 Handley Page's management met the Minister of Aviation, now Julian Amery, to discuss the manufacturer's predicament. There were still some hopes of a merger with HSA. The Handley Page team believed that an offer of ten shillings a share would be acceptable, especially if the Ministry would give the company the contract to convert the Victor into a tanker. Amery reiterated the tenets of the Two Group policy, believing that the time was now ripe for "another manufacturer within the groups to



“The soul of a business lies in the creativeness of the individual, and that progress is not achieved by elephantine size or by soulless bureaucracy . . .”

Sir Frederick Handley Page, February 1961

become acquainted with the Victor”, if only to provide insurance against Handley Page being unable to support the Victor in the future. Amery hinted that he felt the company would struggle to find sufficient capital as time passed. As a result, Handley Page was required to sub-contract half the contract to HSA.¹⁹

Hawker Siddeley and Handley Page continued to discuss a merger; the former was keen to send people to investigate Handley Page’s facilities at Cricklewood and Radlett, and for a financial team to take a look at the books. By late October 1963 Handley Page had put forward “everything concerning [the] company that should enable [HSA] to assess its worth”. Sir Arnold Hall, HSA’s chairman, a hard-nosed businessman, was not impressed. Indeed, given the likely closures and redundancies he expected within the existing HSA structure, taking on Handley Page at a further reduced price of five shillings a share would be quite generous, even allowing for the value of a tax write-off that would accrue from buying the company. Matters would be eased if the Minister of Aviation agreed to the £15m “hardship claim” Handley Page had submitted in respect of cancelled Victors.²⁰

On October 21, 1963, Hall and the Handley Page team met Amery to discuss the merger. Hall made it clear that the gap between his five-shilling offer and the ten-shilling offer that Handley Page felt was necessary to obtain shareholder approval would be covered by the £15m hardship claim. After a period of private consultation, Amery agreed to seek Treasury approval to settle the claim, but only up to £7m, equivalent to a nine-shilling share offer. Sir Arnold said that this was really not acceptable, “but under pressure from the Minister”, he would ask his auditors to examine the offer.²¹ On inspection, this did indeed prove unacceptable to HSA, and the talks collapsed, leaving Handley Page with a limited amount of government work and an uphill struggle to sell the Herald, which had finally received some “launch-aid” (i.e. government subsidisation in return for a share of future profits).

The final years

In retrospect, despite Sandys’ marriage bureau, the whole merger process was something of an *ad hoc* exercise. An August 1964 MoA paper observes that while consolidation resulted from the application of government policy, “this particular duopolistic pattern was the result of accident rather than design. Whether this pattern is to be maintained or modified must depend in some degree on the way in which the government allocates its contracts. Explicitly or implicitly a Government policy, where it wishes to maintain a balance between each pair of duopolists [BAC and HSA, and two engine groups] must, therefore,

BELOW One of the nine Victor B.2(SR)s to serve with the RAF’s strategic reconnaissance specialist unit, No 543 Sqn, which received the type from December 1965, at Wyton in September 1967. Note the “Küchemann carrots” on the wing trailing edges and “elephant ear” ram-air turbine intakes on the rear fuselage, fitted to the B.2 variant.

MIKE HOOKS



The last of the Handley Page line — the prototype Jetstream, G-ATXH, which made the type's first flight on August 18, 1967, is seen here at the SBAC show in 1968, the same year production of the Herald ceased. Despite early powerplant problems, the Jetstream went on to become a successful aircraft — but not, sadly, for its original parent company.



eventually emerge". It went on to note that Shorts and Handley Page were "well-recognised problems". It was a situation made worse by the larger firms also "squeezing the remainder by retaining support and maintenance work".²²

In 1965 Handley Page still had some hopes of attracting grants for work on laminar-flow research projects. The MoA dismissed these suggestions outright; if there were to be such support, it would go to one of the groups, which might then subcontract Handley Page for its expertise in the field. The Ministry explained: "In the light of state policy towards the two main groups it seems unlikely that [Handley Page] can expect any major contract in the future, although it may still be used in specialised fields".

As late as 1965 the MoA still wanted Handley Page to join one of the groups, and felt its refusal to support further development of the Herald was a possible means to do so; "It might be easier to influence them in this direction by holding out no hope of assistance whatever".²³

Handley Page Ltd collapsed in 1969, forced out of business by the cost of launching the Jetstream turboprop business aircraft, the original projected £3m investment having ballooned to more than £13m. After an abortive attempt to continue the company as Handley Page Aircraft Ltd with predominantly American backing, the company was finally wound up for good in March 1970. The Jetstream programme was taken over by Scottish Aviation, itself subsequently absorbed into British Aerospace, the latter concluding that the design was worth supporting.

In retrospect, Handley Page was the most illustrious "victim" of the mergers, but it is hard not to blame the stubbornness of its founder in not accepting commercial and political realities back in 1960, when he had the chance to shepherd his company into a new era of profitable co-operative endeavour.



1 Jackson, James, *748 vs Herald: Healthy Competition or Deadly Conflict*, *The Aviation Historian* Issue 26, pp96–98

2 Jackson, *ibid*; also Technical note to the Transport Aircraft Requirements Committee, April 1959, The National Archives (UK) ref T225/1635

3 Jackson, *op cit*, pp101–102

4 See Hayward, Prof Keith, *Offers they couldn't refuse: Mergers in the British Aircraft Industry, 1957–62*, *The Journal of Aeronautical History*, Royal Aeronautical Society, 2013, for an overview of the rationalisation process

5 Hansard, February 15, 1960, cols 957–960

6 TNA ref AVIA 63/135, November 18, 1959

7 TNA ref AVIA 65/1084, March 18, 1963

8 Sir Frederick Handley Page's meeting with Sandys in October 1959 appears to have been brief, confined mainly to a request for support for the Herald and complaints about the MoA's tough stance over buying three aircraft for "proving" on behalf of BEA. TNA ref AVIA 63/135, October 27, 1959

9 Jackson, *op cit*; also Treasury notes of meetings January 1, 1959, February 3 & 9, 1959, TNA ref T225/1635

10 TNA ref AVIA 63/138, May 12 & 27, June 20 & July 19, 1960

11 TNA ref AVIA 63/138, September 8 & 12, 1960

12 TNA ref AVIA 63/138, September 15, 1960

13 TNA ref AVIA 63/138, October 3, 1960

14 *Flight*, February 17, 1961

15 TNA ref AVIA 63/138, November 10, 1961

16 TNA ref AVIA 63/138, April 25, 1962

17 *Ibid*

18 House of Commons Debates, March 22, 1962

19 Notes of a meeting between Handley Page and the MoA, October 8, 1963, via Handley Page Association

20 A diary of Handley Page's negotiations with HSA, via Handley Page Association

21 *Ibid*

22 MoA paper *Loading in the Aircraft Industry*, August 10, 1964, TNA ref T225/2819

23 TNA ref AVIA 63/138, March 9, 1965

AIRACOBRA: HERO OF THE SOVIET UNION

Digging deep into Russian, British and American archives, **DAN ZAMANSKY** explores why the unusual Bell P-39 Airacobra was dismissed by the British, tolerated at best by the Americans — and surprisingly successful in the hands of Soviet pilots, who found the type rough, tough and capable of delivering a devastating punch with its lethal 37mm cannon



THE BELL P-39 Airacobra was a fighter that most American pilots considered inadequate, at best useful in the low-altitude ground-attack role.¹ The RAF's P-400/Airacobra Mk I was found to be "worthless as an interceptor" above 17,000ft (5,000m) and of limited use below that altitude on account of its restricted manoeuvrability.² It is something of a paradox that the same Airacobra I and later versions of the type were flown by dozens of wartime aces in the Soviet Air Force. Four of the ten highest-scoring Soviet pilots achieved most of their successes flying the Airacobra.³

THE ALLISON FIGHTERS

To understand the advantages and limitations of the basic Airacobra design, it is useful to compare it with three American fighters, all used by the RAF during the early war period, and all of which had similar Allison V-1710 engines with a single-stage supercharger. The P-400 had an operational flying weight of 7,816lb (3,545kg), slightly more than that of the Curtiss Tomahawk II but considerably less than that of the same company's Kittyhawk I and the North American Mustang I. The Airacobra's relatively low weight was due in part to its smaller fuel capacity, at 100 Imp gal (455lit) the lowest among these four aircraft. The Mustang weighed some 617lb (280kg) more than the Airacobra, primarily because of its heavier airframe, as well as a significantly greater internal fuel capacity of 140gal (636lit). The Kittyhawk was even heavier than the Mustang, because it, too, carried more fuel and ammunition than the Airacobra. The latter was thus a relatively light fighter, which gave it the potential to be more agile than its fellow American-built types.

Despite the Airacobra's limited fuel capacity, its range of 630 miles (1,010km) was just 40 miles (64km) less than that of the Kittyhawk, the lower drag of the P-39 allowing it to conserve fuel. However, the Tomahawk's superior range of 800 miles (1,290km), and especially the Mustang's 1,050 miles (1,690km), gave evidence of the fact that, in the American context, the Airacobra was a comparatively short-ranged aircraft. Yet the type could carry a 63gal (285lit) droptank, while the early version of the Mustang had no such provision. With this tank, the Airacobra's range was exactly the same as the Mustang's on internal fuel and sufficient for tactical bomber escort.⁴

The Airacobra's performance in terms of speed was noteworthy for the early period of the war, the type being the second-fastest of the

...WHEN JOHNNY COMES Flying HOME

Above the clouds, through the screaming sounds of a night attack, comes the staccato bark of guns. A cannon's cough pierces the rhythmic whine of screaming motors. There's a flash of flame. Then, Johnny comes flying home. Those few seconds flash back seven years to the start of the fighter plane that has since captured the imagination of men, everywhere. It's the story of blood, sweat, toil and tears through the years when Axis danger seemed a fairy story. Johnny is flying a heavily armed Army Airacobra. It's generally considered the most deadly fighter plane on wings. With speed, fire power and maneuverability on his side—with motor all and guns out front—a cannon firing through the nose—the odds are with Johnny. Much of Aviation's finest skill has been busy for years giving Johnny those odds. And it's never too early to say that we are looking forward to the day when Johnny will really come flying home, to find his place in a new world of peace-time aviation. Stepped up by the needs of war, we know America will have the benefits of the mass production of planes to carry on its commerce and travel in the skies. But Johnny must have these future planes of peace... and when the time comes, we at Bell Aircraft will be doing our part not to let Johnny down. © Bell Aircraft Corporation, Buffalo, New York.

Airacobra for victory—
BELL Aircraft
 FUTURE PLANE FOR PEACE
 PACEMAKER OF AVIATION PROGRESS

Allison-engined fighters at 10,000ft (3,000m), with a maximum speed of 343 m.p.h. (552km/h); some 30 m.p.h. (48km/h) faster than both the Tomahawk and the Kittyhawk and only 10 m.p.h. (16km/h) slower than the Mustang. At 18,000ft (5,500m), however, the Airacobra's top speed of 347 m.p.h. (558km/h) decreased its advantage over the Curtiss fighters to around 20 m.p.h. (32km/h). The Mustang, with a top speed of 366 m.p.h. (589km/h) at the same altitude, was noticeably faster. Overall, the Airacobra's speed was closer to that of the more advanced Mustang than to those of the Tomahawk and Kittyhawk.

The Allison engine common to all four fighters also restricted their climb performance. All but the Kittyhawk could reach 10,000ft in a little more than 5min. The Kittyhawk's performance was considerably worse, needing a minute more to reach the same altitude. At 26,000ft (8,000m) the Allison imposed overwhelming limitations. Even the fastest-climbing Tomahawk needed some 17min to attain this height. The Mustang took 20min and the Airacobra 21min. The inadequate Kittyhawk required a full 25min.⁵ The Airacobra's climb performance at medium and high altitudes was certainly weak, but even so it retained a considerable superiority over the Kittyhawk.

RAF Fighter Command was in a position to reject the Airacobra because it possessed another

OPPOSITE PAGE Captain Fedor Shikunov, a commanding officer with the 69th GIAP and 21-victory ace, stands beside his Airacobra adorned with red-star "kill" markings and Order of Alexander Nevsky emblem on the type's distinctive "car door". Awarded the Order in April 1944, Shikunov was killed in March 1945. VIA VALERiy ROMANENKO



ABOVE Originally to be called *Caribou* in RAF service, the P-39, or P-400 as the export version was designated by Bell, was ordered by the British in April 1940, and one of the first to be evaluated in the UK was AH573 in August 1941. Although found to suffer from poor performance at altitude, the type served with No 601 Sqn until March 1942.

fighter — the Supermarine Spitfire VB — with substantially superior performance. The British assessment was that the Airacobra “could not normally compete” with the Spitfire unless the former had an initial height advantage. The Spitfire climbed faster, was considerably more manoeuvrable at all altitudes and much faster above 15,000ft (4,500m).

The RAF’s report on the Airacobra, however, stressed four advantages of the type, all of which would prove critically important in Soviet service. The first was the “excellent field of view” from the cockpit. Combined with a good radio, this meant the pilot could easily see and report the position of the enemy. The Airacobra also had an unusually heavy armament of one cannon and six machine-guns. Its key performance advantage was that it dived faster than either the Spitfire or the Luftwaffe’s Messerschmitt Bf 109E, a captured example of which had been extensively tested in comparative trials with a Spitfire and Airacobra.⁶

‘COBRAS FOR UNCLE JOE

The decision to supply large numbers of Airacobras to the Soviet Union was made in the late spring of 1942, as a result of the somewhat peculiar process by which the RAF allocated its fighters. At this time, as a result of Japan’s offensive in the Pacific, Allied resources were under particular strain. For this reason, the Soviet Union’s demands for the supply of large numbers of fighters, which amounted to 20 per cent of overall Anglo-American production at the

time, were particularly difficult to meet. The RAF decided to allocate fighters based on the principle that previously existing commitments should be maintained. Hawker Hurricanes and Kittyhawks had been assigned to the Far and Middle East, and the former was also judged essential for the nocturnal air defence of Britain. Mustangs had been allocated to Army Co-operation Command. Only in the case of the allocation of Spitfires was there a clear understanding of the importance of the performance of specific aircraft types, a statement declaring that the Spitfire represented “the backbone of the air defence of this country”.

The result was that the Soviet Union was to be offered such Hurricanes as could be spared, the Airacobra and also the Typhoon, which was suffering significant development delays and had not yet entered operational service. Thus, instead of replacing the inferior Hurricane and Kittyhawk in RAF squadrons, the Airacobra became the default choice for supplies to the Soviet Union.

Two further considerations influenced the choice of fighter to be supplied to the USSR. The RAF was aware in general terms that fighters on the Eastern Front operated “at a lesser altitude than is normal on the Western front,” hence the low-altitude Airacobra and Typhoon being deemed more appropriate for that theatre. More importantly, the British felt that they confronted a more serious threat in the air, “facing . . . no less than two-thirds of the German fighter force”.⁷ This was quite close to the truth, for, at the end of March 1942, just 454 of the Luftwaffe’s 1,257



ABOVE The 'Cobra's bite' — USAAF officers pose in front of a P-39N in the USA, holding examples of the type's powerful armament, comprising a Browning M4 37mm autocannon (centre), which fired through the propeller hub, plus two 0-50in machine-guns mounted in the nose behind the prop and four wing-mounted 0-303in machine-guns.

single-engined fighters were on the Eastern Front.⁸

The pressure on RAF resources ultimately meant that just 255 Airacobras were sent east from Britain, 53 of which were sunk in transit. The only Typhoon ever delivered was a single example handed over in Basra, Iraq, in the closing weeks of the war. It was the USA that would carry the main burden of Soviet supply from late 1942 onwards.⁹ This was partly because the developing crisis in the Pacific led to large-scale diversions of aircraft intended for Britain to the USAAF, and thus restricted the number of American aircraft that Britain could send onward to the USSR.

SCANDAL WITH STALIN

By the end of July 1942, 375 of the total British order for 674 P-400/Airacobra Is, as well as all 494 of the similar P-39D-1s, had been diverted to the USAAF.¹⁰ Some 190 P-400s and 130 P-39Ds were eventually sent to the south-west Pacific to assist in halting the Japanese offensive.¹¹

Allied resource limitations, combined with the policy of diversion of aircraft from the USA to meet immediate American priorities, made the Airacobra the focus of a political scandal in the autumn of 1942. During September 11–12 Gen Dwight D. Eisenhower, then Commander of the US Army in Europe, met with Winston Churchill at Chequers, securing an agreement that Airacobras be redirected to American forces preparing for the planned Operation Torch landings in North Africa.¹² By the 16th, the Soviet Ambassador in London, Ivan Maisky,

was protesting that these aircraft were being unloaded from the planned PQ-19 convoy to the USSR.¹³ The next day, Maisky raised the pressure, stressing that the Soviet Union "was in desperate need of aircraft".¹⁴ Unknown to Britain, Stalin sent a vicious telegram to Maisky on the 20th:

"Your behaviour during the talks with [Anthony] Eden on the question of Airacobras was cowardly. This is unworthy of a Soviet ambassador. I consider the behaviour of the English in the question of Airacobras the height of brazenness. The English did not have any right to redirect our cargo . . . the Soviet government demands that the 154 Airacobras captured by the English [sic] be immediately returned to the Soviet Union . . . after Beaverbrook's departure England has been treacherous".¹⁵

With the military crisis on the Eastern front worsening, Stalin rapidly changed his tone. On the evening of October 3, 1942, he sent a pleading request to Churchill:

"I must inform you that our situation in the Stalingrad area has taken a turn for the worse since early September. The Germans turned out to have big reserves of aviation, which they built up in the Stalingrad area and won a double superiority in the air. We did not have enough fighters to cover the ground troops. Even the bravest troops become helpless when they are not covered from the air. We especially need Spitfires and Airacobras."¹⁶

For Stalin, unlike for the RAF, the Airacobra bore direct comparison to the Spitfire, and he



ABOVE American airman R.S. Berry hands over P-39N-5 Buffalo Belle to Colonel Engineer Nikolai Kalinnikov of the Soviet Military Acceptance Commission at Ladd Field, near Fairbanks, Alaska, in preparation for the aircraft's flight to the Soviet Union using the ALSIB route; for more on the latter see Dave Stern's *Sub-Zero Inc* in TAH11.

specifically inserted the mention of both types into his draft.¹⁷ He followed up with a similar appeal to Franklin Roosevelt on October 7:

"We are sorely in need of an increase in the deliveries of fighter aircraft of a modern type (for example, Airacobra) . . . it should be kept in mind that Kittyhawk aircraft do not withstand the struggle with current German fighters."¹⁸

The extent of Stalin's troubles is underlined by the fact that, far from reinforcing the Stalingrad sector with (non-existent) fighter reserves, the Luftwaffe had in fact withdrawn some fighters in late September. These included the detachment of a dozen pilots of fighter *Gruppe* III./JG 52, who had claimed a remarkable total of 167 victories that month. One such was Hermann Graf, the first ace to score 200 victories.¹⁹ The Soviet pilots flew inferior aircraft and were overwhelmed by the Luftwaffe. The Soviet Air Force's highly experienced 9th GIAP (Guards Fighter Regiment) had an established strength of 20 Lavochkin-Gorbunov-Gudkov LaGG-3s, and lost 46 in three months. The unit was withdrawn from Stalingrad in mid-September.²⁰ Not for nothing was the LaGG derided as a "lacquered guaranteed grave".

Rather than placing conditions on assistance to a weakened Stalin by demanding an end to his imperialist designs on post-war Europe, the Allies dutifully responded to his letters with a significant flow of supplies. The Americans would be the source of the greater part of this flow, covering some of the existing British supply quotas as well as their own.

By the end of November 1942, 310 Airacobras had already been despatched directly from the USA to the USSR in fulfilment of British commitments. These included replacements for the aircraft reassigned to *Torch*.²¹ By the time Airacobra deliveries to the USSR ended in 1944, a total of 4,750 had arrived from America, of which 2,638 counted towards British quotas.²²

THE KUBAN BRIDGEHEAD

Fundamental to understanding the importance the Airacobra adopted in Soviet service is its role in the fighting for the Taman Peninsula on the western edge of the Caucasus mountains in the spring of 1943. The German defence of this bridgehead, bounded on its eastern edge by the Kuban river, has been called "one of the most absurd operational situations in the entire war", on account of its geographical isolation from the main Eastern Front to the north.²³ In fact, two operations in this area were of enduring importance, for they marked the rebirth of Soviet air power and the decline of the Luftwaffe's ability to influence the course of the conflict.

The first of these was the German *Neptun* offensive in April 1943 against the Soviet "*Malaya Zemlya*" (Little Land) beachhead just south of the major port of Novorossiysk.²⁴ The beachhead survived a week of German attacks largely intact. This Soviet defensive success was followed by an offensive on the eastern flank of the Taman bridgehead, which outflanked and captured the fortified town of Krymskaya on May 4.²⁵ In both



ABOVE The vast distances covered by the ALSIB delivery route called for extra ferry fuel provision for the P-39, and a Soviet Air Force example is seen here carrying a non-jettisonable 145 imp gal (660lit) belly tank. The tank provided much-needed extra range, but any attempt at a belly landing with one attached would have been suicidal.

operations, Soviet bombers inflicted considerable losses on German ground forces and thus provided important assistance to the Red Army. In neither case was the Luftwaffe able to intervene decisively, despite considerable efforts. This was unusual at this stage of the war and especially so in the southern sector of the Eastern Front, where the Luftwaffe had repeatedly inflicted heavy losses on Soviet forces.

The successes of the Soviet 4th Air Army over the bridgehead were due in large part to the emergence of the Airacobra as the backbone of its struggle for air superiority. Three of the Army's fighter regiments were equipped with the Airacobra; the 16th GIAP, 45th IAP (Fighter Regiment) and 298th IAP. The aircraft for these units initially came via the "Persian corridor" of Lend-Lease deliveries through Iran, which provided a total of 187 Airacobras up to the end of May 1943. In the same month, another 35 aircraft arrived via the ALSIB (Alaska—Siberia) air ferry route.²⁶ The three fighter regiments included some pilots with considerable experience, including two notable 16th GIAP aces, Vadim Fadeev and Alexander Pokryshkin. Both had flown more than 350 operational sorties before their unit switched from the Yakovlev Yak-1 to the Airacobra.²⁷ The American fighter's qualities allowed this experience to flourish. Already in March 1943, the Army had reported that the arrival of Airacobras and a small number of Kittyhawks had led to a "great change" in air combat tactics, allowing these units to attack from superior altitudes and

fight in the vertical plane — diving and climbing — rather than relying on horizontal tight turns.²⁸

By the end of April 1943 a full and very positive assessment of the Airacobra had emerged. At the most common combat altitude of 10,000ft–16,000ft (3,000m–5,000m), it was deemed equal to the Bf 109 in manoeuvrability and similar in sustained climb performance. It was essential, however, to keep the Airacobra's speed up, for its acceleration and zoom climb was inferior to that of the Messerschmitt. In the horizontal plane and in the dive, the American fighter outmatched any German type. The 37mm cannon of the P-39, which had replaced the 20mm cannon of the RAF's P-400, could destroy an enemy aircraft with a single hit.²⁹

Just as important as the Airacobra's performance was its role in the radio revolution taking place in the Soviet Air Force. The 4th Air Army acknowledged that radio direction of aircraft from the ground played "an exceptionally large role" in its successes. A notable radio command post was *Belka-5* (Squirrel-5) of Gen Borman, an ethnic German who commanded the 216th SAD (Mixed Air Division), incorporating two of the three Airacobra regiments. The Airacobra's efficient radio enabled Borman to redirect fighters to intercept new German flying formations as they appeared, as well as to warn of the presence of enemy fighters.³⁰ On May 21 Borman was promoted to command the Fighter Air Army defending Moscow.³¹

The large-scale battles of the spring cost the 4th



ABOVE LEFT Alexander Pokryshkin, wearing flying helmet and a chestful of decorations, discusses tactics with his comrades beside fellow Airacobra ace Grigory Rechkalov's distinctively marked P-39N-0, serial 42-8747, in August 1944. **ABOVE RIGHT** Grigory Andreevich Rechkalov, the Soviet Union's highest-scoring Airacobra ace.

Air Army 515 aircraft in combat, including 348 fighters, 59 of which were Airacobras. Although the losses were heavy, the Airacobra's superior combat effectiveness was further underlined by its substantially lower loss-rate per sortie than that of the Soviet-produced types. During April 1943, the most difficult month, the Airacobra's loss rate was two per cent, compared with six per cent for the LaGG-3 and an awful eight per cent for the Yak-1. The scale and intensity of the combat contributed to very high numbers of victory claims being reported by Soviet fighters during the spring; a total of 1,172 enemy aircraft, including 795 Bf 109s, of which the P-39s accounted for a large proportion. In April alone, the Airacobras of the 45th IAP and 16th GIAP claimed 90 Bf 109s and 22 other aircraft.³²

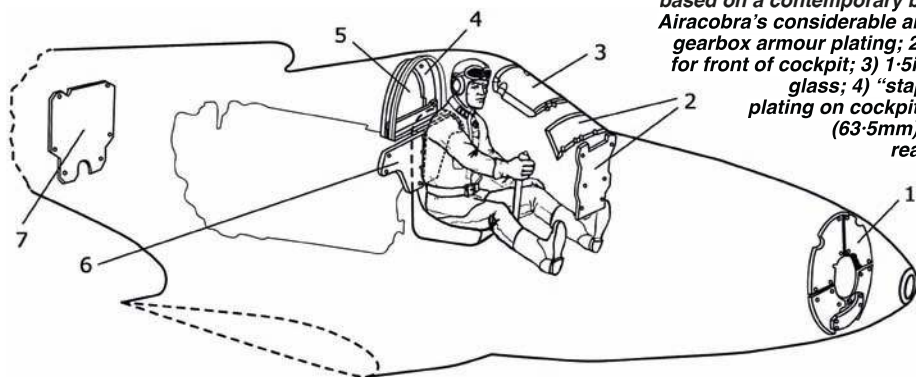
In April and May three aces of the 16th GIAP were especially effective. Alexander Pokryshkin achieved the most extraordinary success of all, with 20 aerial victories. Grigory Rechkalov claimed another 16.³³ Vadim Fadeev scored 15 in just 24 days, but on May 5 he was shot down and killed by a future commander of Germany's

post-war air force, Günther Rall, who achieved his 135th aerial victory.³⁴ However, despite all the improvements in the Soviet Air Force, the German fighter force retained qualitative superiority over its opponents, suffering much lower losses. Luftwaffe units, including Slovak and Croatian detachments, actually lost no more than 70 Bf 109s written off to all causes in the bridgehead during these months, about 25 of these in April.³⁵

THE 'COBRA'S TACTICAL SIGNIFICANCE

The true value of the Airacobra lay not in the losses inflicted on German fighters, but in allowing the Soviet Air Force to achieve its overarching objectives. An illuminating example was the escort of 12 Douglas Boston light bombers, another Lend-Lease import, by 16 Airacobras of the 16th GIAP on April 24, 1943. The distance of 75 miles (120km) from the regiment's base at Popovicheskaya to the target near Malaya Zemlya was a considerable one in the context of the tactical focus of Soviet air operations. Seven of the unit's aces participated,

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This illustration by VALERIY ROMANENKO, based on a contemporary brochure, shows the Airacobra's considerable armour protection: 1) gearbox armour plating; 2) two armour plates for front of cockpit; 3) 1.5in (38mm) armoured glass; 4) "staple-shaped" armour plating on cockpit frame; 5) rear 2.5in (63.5mm) armoured glass; 6) rear armour plating; 7) engine and oil tank armour plating.



ABOVE The unusual tricycle undercarriage was considered an advantage by Soviet P-39 pilots, affording excellent visibility during taxiing. Also, if the aircraft hit a dip in the airfield's surface, it would not flip on to its back like its taildragger contemporaries tended to, although the nosewheel might collapse, as seen with this 19th GIAP P-39M.

and five Messerschmitts were claimed shot down. None were in fact lost, while three Airacobras and two Bostons failed to return.³⁶ As often happened in aerial combat, the youngest pilots paid with their lives for their inexperience. Vasily Ostrovsky, flying his eighth combat sortie, was shot down by German fighters and killed by a burst of fire while descending in his parachute.³⁷ He was the third of Pokryshkin's wingmen to fall within 16 days. The ace was particularly distressed by the manner of this young man's death and henceforth ordered his pilots to shoot German pilots baling out of their aircraft.³⁸ In spite of the losses, the attack by the remaining Bostons was so successful that it allowed Soviet ground troops to counter-attack immediately, and was specifically commended by Gen Leselidze, who commanded the defence of the beachhead.³⁹ In instances such as this, the Airacobra increased the effectiveness of the Soviet Air Force as a whole, not just the fighter force.

It is noteworthy that Soviet use of the Airacobra was on a much larger scale than that of the USAAF, as demonstrated by a comparison of losses sustained by both. American forces in

the southern Pacific lost 129 Airacobras in 1942, 49 of these in combat. In 1943 the US Fifth Air Force in New Guinea lost 57, including just nine in combat.⁴⁰ In the Mediterranean the only significant engagement involving the Airacobra occurred on March 13, 1943, when seven P-39Ds of the inexperienced 81st Fighter Group were shot down by the Bf 109s of II./JG 77.⁴¹ The acknowledged Soviet combat losses, sustained during three years of war, were 1,030 Air Force Airacobras and another 124 of the naval air arm.⁴² German fighter pilots are known to have claimed 1,811 Airacobras up to the end of October 1944, illustrating the twin problems of aircraft misidentification in combat and the exuberance of fighter pilots. Erich Hartmann, the highest-scoring pilot of the war, claimed 82 Airacobras, and the Arctic ace Walter Schuck another 45.⁴³

TURNING THE TABLES

As the Soviet Airacobra units grew into an effective air superiority force, they extracted a heavy price for the successes of Luftwaffe pilots. Gerhard Homuth, the 63-victory ace and

THE TEN HIGHEST-SCORING SOVIET AIR FORCE AIRACOBRA ACES



| Name | Unit | Claims (P-39)* | Notes |
|-----------------|------------------|----------------|---|
| G.A. Rechkalov | 16th GIAP | 61+4 (53+3) | — |
| A.I. Pokryshkin | 16th GIAP | 46+6 (40+0) | — |
| D.B. Glinka | 100th GIAP | 50+0 (39+0) | — |
| N.D. Gulayev | 129th GIAP | 55+5 (37+3) | — |
| I.I. Babak | 100th, 16th GIAP | 35+5 (35+0) | Hit by anti-aircraft artillery; PoW 16.3.45 |
| A.S. Smirnov | 28th GIAP | 35+1 (34+1) | — |
| M.S. Komelkov | 104th GIAP | 33+7 (33+7) | — |
| A.F. Klubov | 16th GIAP | 31+3 (28+0) | Killed in La-7 crash 1.11.44 |
| B.B. Glinka | 100th, 16th GIAP | 27+2 (27+2) | Wounded in action against Fw 190, 14.7.44 |
| A.A. Egorov | 212th GIAP | 25+0 (25+0) | — |

* Individual + shared claims. Figures in brackets are claims made while flying the Airacobra



ABOVE Soviet pilots of the 508th IAP compare notes beside P-39Q-25-BE serial 44-3286 in Poland in 1944. The Q variant was the final and most numerous version of the P-39, some 4,095 being produced, of which 2,849 were sent to the USSR, the P-39Q serving well into the early 1950s. Note the four-bladed propeller, fitted only to the P-39Q-21 and -25 sub-variants.

RIGHT Dmitry Glinka was one of two brothers who went on to become Airacobra aces, the other being Boris, both serving with the 45th IAP (later 100th GIAP) during their wartime careers. Dmitry accounted for a total of 39 enemy aircraft while flying the P-39, and Boris 27 plus two shared. Dmitry is seen here wearing a "kubanka" beside a P-39K, probably 42-4403 "White 21", circa March 1943.



BELOW Pilots of the 9th IAP (later 211th GIAP) at Krasnoyarsk in Siberia with P-39Ns freshly delivered via the ALSIB route. The Airacobras are inscribed "Krasnoyarsk collective farm member" (foreground) and "Krasnoyarsk worker" (background). Both were presentation aircraft supposedly purchased by public subscription — although the USSR received them free of charge.



A P-39 in flight while in service with the 9th IAP in the spring of 1944, possibly Buffalo Belle as seen on page 22 (note the artwork forward of the cockpit), and, unusually for a Soviet Airacobra, wearing a large red star on the fin. The Soviets found that the Airacobra could suffer structural distortion in the rear fuselage, and so added reinforcing plates; it may be one of these obscuring part of the fuselage star in this photograph.



commander of Focke-Wulf Fw 190 Gruppe I./JG 54, was shot down by the 67th GIAP on August 2, 1943.⁴⁴ Berthold Korts, a 113-victory ace and commander of Bf 109 *Staffel* 9./JG 52, was lost to Airacobras on August 29. Airacobras may also have inflicted the only losses of the Heinkel He 177 sustained in air combat on the Eastern Front. It has been reported that around ten of these heavy bombers were lost to fighters while attacking Soviet tanks in the summer of 1944.⁴⁵

In fact, only two such losses are known, both on July 28, 1944. Reported as shot down were He 177s with codes V4+CN, south-west of Eleja in Latvia, and V4+PT, near Joniškis in Lithuania.⁴⁶ Both locations were along the line of the dramatic advance of the Sherman and Valentine tanks (also Lend-Lease) of the 3rd Guards Mechanised Corps through the Baltic states to the coast of the Baltic Sea.⁴⁷ Alexei Smirnov, an Airacobra ace of the 28th GIAP, claimed a Messerschmitt Me 210 shot down near Gluda, not far from Eleja, while covering the advance.⁴⁸ However, this incident

occurred before the He 177s took off.⁴⁹ A claim more likely to be connected to the operations of the Heinkels is one made by the 494th IAP ace Ilya Tsykin for a Junkers Ju 88 above Joniškis.⁵⁰ No other Soviet fighters claimed multi-engined aircraft in this area, and no other German bombers are known to have been lost, so it is possible that this Airacobra pilot achieved a unique success.

SOVIET HERO

The importance of the Airacobra to the Soviet Air Force is emphasised by the fact that it was flown in combat by 50 fighter regiments, 28 of which were Guards units. Some 30 Airacobra regiments were on strength with the Soviet Air Force; 14 others were PVO (Air Defence Force) units and six belonged to the VVS VMF (Naval Air Force).⁵¹ The three Air Force regiments which fought over the Taman bridgehead were later combined within the 9th GIAD (Guards Fighter Division), which Pokryshkin rose to command. As the table of highest-scoring Airacobra regiments

THE TEN HIGHEST-SCORING SOVIET AIR FORCE AIRACOBRA REGIMENTS



| Unit | Command | P-39 from | Claims (all / P-39*) |
|---------------------------|-------------|---------------|----------------------|
| 16th GIAP (ex-55th IAP) | 9th GIAD | April 1943 | 587 / 495 |
| 129th GIAP (ex-27th IAP) | 22nd GIAD | October 1943 | 521 / 300 |
| 100th GIAP (ex-45th IAP) | 9th GIAD | February 1943 | 428 / 341 |
| 104th GIAP (ex-298th IAP) | 9th GIAD | February 1943 | 423 / 378 |
| 28th GIAP (ex-153rd IAP) | 5th GIAD | June 1942 | 406 / 300 |
| 30th GIAP (ex-180th IAP) | 273rd IAD | March 1943 | 381 / 225 |
| 2nd GIAP SF† | 6th IAD SF† | October 1942 | 361 / 200 |
| 213th GIAP (ex-508th IAP) | 22nd GIAD | October 1943 | 311 / 200 |
| 72nd GIAP (ex-485th IAP) | 5th GIAD | November 1943 | 302 / 200 |
| 212th GIAP (ex-438th IAP) | 22nd GIAD | October 1943 | 265 / 200 |

* Round figures are estimates, based on length of time in action with Airacobra, compared with other types used by unit † SF — Northern Fleet

- 1 McManus, John C., *Deadly Sky: The American Combat Airman in World War II*, Presidio Press, 2000, pp44–45
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- 4 The National Archives, UK (TNA), ref SUPP 9/2
- 5 TNA refs AVIA 18/711, 18/725, 18/732, 18/734. Also Hancock, Terry, *Directory of Britain's Military Aircraft: Fighters, Ground Attack, Strike and Overland Reconnaissance*, The History Press 2008
- 6 TNA ref AIR 20/12769
- 7 TNA, CAB 66/24/8
- 8 NARA, US Strategic Bombing Survey (USSBS) document 59 b; *German Air Force — Order of Battle and Losses*. Courtesy Steven J. Zaloga
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- 10 Bailey, Gavin J., *The Arsenal of Democracy: Aircraft Supply and the Anglo-American Alliance, 1938–1942*, Edinburgh University Press 2013, p206
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- 12 Butcher, Harry C., *My Three Years with Eisenhower: The Personal Diary of Captain Harry C. Butcher, USNR, Naval Aide to General Eisenhower, 1942–1945*, Simon & Schuster 1946
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- 14 TNA ref FO 954/25B/389
- 15 Russian State Archive of Social & Political History (RGASPI), fond 558, opis 11, delo 60, list 57
- 16 RGASPI, fond 558, opis 11, delo 257, list 71
- 17 RGASPI, fond 558, opis 11, delo 257, list 74
- 18 RGASPI, fond 558, opis 11, delo 364, list 69
- 19 Prien, Jochen et al, *Die Jagdfliegerverbände der Deutschen Luftwaffe 1934 bis 1945: Teil 9/II Von Sommerfeldzug 1942 bis zur Niederlage von Stalingrad. 1.5. 1942 bis 3.2. 1943*, Rogge GmbH 2006, p528
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- 21 TNA ref AIR 22/310
- 22 Report on War Aid furnished by the United States to the USSR June 22, 1941–September 20, 1945, November 28, 1945.
- 23 Citino, Robert M., *The Wehrmacht Retreats: Fighting a Lost War, 1943 (Modern War Studies)*, University Press of Kansas 2012, p233
- 24 Forczyk, Robert, *The Kuban 1943: The Wehrmacht's Last Stand in the Caucasus (Campaign 318)*, Osprey Publishing 2018, pp49–52, 57
- 25 Ibid pp45, 61
- 26 I am grateful to Ukrainian aviation researcher Valeriy Romanenko for this information
- 27 Central Archive of the Ministry of Defence of the Russian Federation (TsAMO), fond 20046, opis 1, delo 18, list 11
- 28 TsAMO, fond 319, opis 4798, delo 56, list 97
- 29 TsAMO, fond 319, opis 4798, delo 70, list 59
- 30 TsAMO, fond 319, opis 4798, delo 70, list 28–30
- 31 NKO (People's Commissar of Defence) Order 0087 of May 21, 1943; Reorganisation of the Command of the Moscow Air Defence System
- 32 TsAMO, fond 20046, opis 1, delo 18, list 17
- 33 Bykov, op cit, pp953–954, 1000, 1222–1223
- 34 *The Kuban Bridgehead*; a periodical journal of the casualty search movement of the region. "A letter to us", January 7, 2017
- 35 Calculation made by author using database of Luftwaffe aircraft losses kindly provided by Finnish aviation researcher Matti Salonen
- 36 TsAMO, fond 20046, opis 1, delo 18, list 11
- 37 TsAMO, fond 20046, opis 1, delo 18, list 12
- 38 *The Kuban Bridgehead*, op cit. "Lieutenant Ostrovsky and his Airacobra", November 11, 2016
- 39 TsAMO, fond 319, opis 4798, delo 70, list 34
- 40 I am grateful to Australian aviation researcher Michael J. Claringbould for this information, based on his own extensive investigation of the subject
- 41 Shores, Christopher et al, *A History of the Mediterranean Air War 1940–1945; Volume Three: Tunisia and the End in Africa, November 1942–May 1943*, Grub Street 2012, pp385–386
- 42 *Soviet Aviation in the Great Patriotic War by the Numbers*, Moscow: VVS (Air Force) Main Staff, 1962. Tables in Chapter 6
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- 47 TsAMO, fond 3428, opis 1, delo 82, list 121–123
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- 49 I am grateful to Australian aviation researcher Dr Andrew Arthy for providing this information
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- 51 Data from Bykov and Anokhin, op cit
- 52 Bykov, op cit
- 53 TsAMO, fond 20237, opis 1, delo 74, list 229

shows, his division was the most successful of the commands equipped with the P-39, but numerous other units achieved high scores flying the type.

Many of the highest-scoring Soviet aces flew the Airacobra, and for them it was the aircraft in which they scored most or all of their aerial victories.⁵² Not one of the ten highest-scoring Airacobra aces was killed in combat, proving that the Airacobra's qualities as a fighter were of high value on the Eastern Front. This was due in part to the fact that the P-39Q, the final production version of the Airacobra, possessed a top speed

of 385 m.p.h. (620km/h) when lightened by the removal of the wing machine-guns. As of June 1944, this was exceeded only by the Lavochkin La-5FN among Soviet fighters. The P-39Q's range of 740 miles (1,190km) was 160 miles (260km) greater than that of the Lavochkin. The longest-ranged Soviet fighter, the Yakovlev Yak-9D, had a range of just 870 miles (1,400km), substantially less than that of contemporary American escort fighters.⁵³ When compared with its Soviet-built contemporaries, the Airacobra proved to be an invaluable air superiority fighter.



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IRAN'S WEASEL DIESELS

THE F-4D PHANTOM IN IRANIAN SERVICE

In 2019 the Islamic Republic of Iran Air Force took post-overhaul re-delivery of its longest-serving McDonnell Douglas F-4D Phantom II — the oldest still-operational example in the world — for possible service until 2040. **BABAK TAGHVAEE** chronicles the Iranian career of the “Diesel”, now in its sixth decade, including the variant’s use as a “Wild Weasel”

RIGHT The official seal of the Imperial Iranian Air Force. The IIAF entered the jet age with the acquisition of Republic F-84G Thunderjets supplied by the USA as part of the Mutual Defense Assistance Program. Both the F-84G and its successor, the North American F-86 Sabre, were used for the IIAF's formation aerobatic team, Golden Crown, the full story of which was told by the author in TAH21.



MAIN PICTURE With a fuel complement of a 370 US gal (1,400lit) tank on each wing and a central fuselage-mounted 600 US gal (2,270lit) tank, IRIAF "Diesel" 3-6714 (c/n 3564) was displayed at the Dezful Airshow in March 2012, shortly after its re-delivery following an extensive upgrade and lifetime-extension programme.

BABAK TAGHVAEE

IN AUGUST 2019 the oldest McDonnell Douglas F-4 Phantom II still in operational service anywhere in the world was re-delivered to the Islamic Republic of Iran Air Force (IRIAF) after having been overhauled by Iranian Aircraft Industries (IACI). The Phantom, IRIAF serial 3-6690 (originally 3-601), was the very first F-4D variant to be delivered to the pre-Islamic Revolution Imperial Iranian Air Force (IIAF), on September 18, 1968. Only eight of the total of 32 original F-4Ds the IIAF received during 1968–69 now survive, and are affectionately referred to as "Diesel Phantoms" by their pilots. The original IIAF plan was to have retired all its Diesels from service by 1985,



but the air arm continues to use them for training the IRIAF's F-4E and RF-4E pilots of the 101st Combat Command Training Squadron/Tactical Fighter Squadron (CCTS/TFS) at Konarak/Chabahar in south-eastern Iran. Remarkably, there is no retirement plan for them and, thanks to upgrade and lifetime-extension programmes, they are scheduled to remain in service until 2040.

PHANTOMS FOR PERSIA

During 1964–67 Iran's neighbour, Iraq, received a total of 52 MiG-21F-13 and MiG-21PF fighters and MiG-21U-600 combat trainers from the Soviet Union. These state-of-the-art delta-winged fighters posed a serious threat to Iran, the IIAF having only ageing North American F-86Fs and Northrop F-5A/Bs. The F-5A's combat radius was superior to that of the MiG-21, but IIAF commanders — and the Shah himself — were under no illusions that the two could compete on equal terms. In addition to the MiG-21s, the Iraqi Air Force had also acquired ten Soviet-built Tupolev Tu-16KSR-2-11 strategic heavy bombers in 1962, capable of reaching any target deep in Iranian territory — including the capital, Tehran.

In response, Iran set about procuring General Dynamics F-111As and F-4Cs from the USA. Iran's request for the former was rejected, but the sale of F-4Ds to Iran was approved and an order was placed for 16 in July 1967, followed by another for 16 more later that year. Deliveries began with the first four aircraft — American serials 67-14869, 67-14870, 67-14871 and 67-14872 — as part of the USA/Iran *Peace Roll* Foreign Military Sale (FMS) programme in September 1968.



ABOVE Pilots of the F-4D-equipped 72nd TFS pose for a photograph to celebrate the squadron's establishment on October 15, 1974, at Shiraz. Standing from left to right are pilots Zarrabi, Meiguiee, Tahani, Ekradi, Daneshmandi (the unit's CO), Behroozfar, Miri, Shrichi, Amiri and Noorhaghigi; crouching are Namaki, Ahmad-Beigi and Salman.

By the end of 1969 all 32 F-4Ds — in two batches; serials 67-14869 to 67-14884 and 68-6904 to 68-6919 (IIAF serials 3-601 to 3-632) — had been delivered to the IIAF, making Iran the second foreign operator of the Phantom, after the UK.

To arm the F-4Ds, Iran also procured 400 AIM-4D Falcon infra-red short-range air-to-air missiles (AAMs) and 125 AIM-7C Sparrow semi-active radar-homing medium-range AAMs. The F-4Ds initially entered service with the 101st and 102nd Tactical Fighter Squadrons based at the 1st Tactical Fighter Base (TFB) at Mehrabad, Tehran, before being sent to Shiraz, where they were used by two newly established fighter squadrons — the 71st TFS, known as the “Sharpshooters”, and the 72nd TFS — based at the 5th TFB (now 7th TFB) at Shiraz until 1976, when the surviving examples were sent to the 6th TFB at Bushehr on the Persian Gulf coast of south-western Iran.

INTO ACTION

The IIAF's new F-4Ds would not have to wait long to see action — of sorts. During Joint Operation *Arvand* on April 24, 1969, Imperial Iranian Army, Air Force and Navy forces combined to regain Iran's sovereignty over the Shatt al-Arab / Arvand Rud after an Iraqi threat to Iranian commercial shipping in the strategically important river. Eight F-4Ds fully armed with bombs, AIM-4Ds and AIM-7Cs were put on alert at the 1st TFB, to be ready to bomb Baghdad's power stations and oil refinery in case of any Iraqi military response to the passage of *Ebn-e-Sina*, an Iranian commercial ship, as it moved down the Shatt al-Arab. The Iraqis did not stop the freighter, however, and the IIAF F-4Ds were stood down.

In 1972 the IIAF restructured its serial system, the remaining F-4Ds becoming 3-663 to 3-691, two having been lost in crashes; 3-603 (c/n 3071, 67-14871) on September 25, 1969, and 3-618 (c/n 3340, 68-6905) on January 30, 1972. In 1975 they were re-serialised again, becoming 3-6690 to 3-6717, two more having been lost by then.

The IIAF's F-4Ds later saw combat during the long-running Dhofar Rebellion in Oman, against the Soviet-backed rebels of the Popular Front for the Liberation of Oman (PFLO) and their South Yemeni Marxist allies during the 1970s. In 1976, when the F-4Ds were stationed at Bushehr, their participation in the conflict increased, regularly undertaking forward-deployments to Konarak, near the port of Chabahar in south-eastern Iran, 175 miles (280km) north-east of Muscat across the Gulf of Oman. The Phantoms' role was to provide top cover for IIAF RF-4Es undertaking tactical reconnaissance missions over South Yemen and the Dhofar province of Oman.

During one of these missions on November 24, 1976, an IIAF RF-4E was shot down by a Yemeni rebel man-portable air-defence system (MANPADS) over the Gulf of Aden off the coast of South Yemen. The pilots, who ejected safely, were taken prisoner. To prevent the Soviets accessing and inspecting the wreckage of the RF-4E, several F-4Ds, supported by KC-707 tankers, were despatched from Chabahar to destroy the Phantom's remains with their SUU-23 gun pods.

In the early 1970s the Shah was impressed by an in-depth briefing on the use of laser-guided bombs (LGBs) by the USAF's Phantoms during the Vietnam War. In 1972 Iran requested the procurement of 1,500 GBU-10 Paveway I LGBs



ABOVE With the snow-capped Alborz mountains providing a majestic backdrop, F-4D 3-601 taxis in trailing its brake parachute at Mehrabad circa 1970–71, with student pilot 1st Lt Kayvan Noorhaghghi in the front seat and instructor Capt Javad Fakkouri in the rear seat. **BELOW** The patch worn by the IIAF's RHAW "Wild Weasel" crews.

from the USA, along with kits for modifying up to 12 F-4Ds for such use, which was accepted the following year. Subsequently, IACI modified six F-4Ds to carry an AN/AVQ-9 "Zot Box" airborne laser designator (ALD) mounted on the aft canopy, as well as an AN/APS-107 radar homing and warning (RHAW) system to become "Wild Weasels", capable of using AGM-45 Shrike anti-radiation missiles for the suppression of enemy air defences (SEAD).

WEASEL DIESELS

The six F-4Ds selected to become Wild Weasels were 3-6690; 3-6696; 3-6700; 3-6701; 3-6707 and 3-6708. All were modified by IACI during their depot maintenance programme. Six additional kits were procured to modify six more F-4Ds for the Wild Weasel role, but these were never fitted. The IIAF originally planned to use 12 F-4D Wild Weasels for SEAD operations and precision bombing, but the poor performance of their Zot Box ALDs and the unreliability of the AN/APS-107 led to their being used only for the training of pilots and back-seat weapons systems officers (WSOs) for the prospective F-4G Wild Weasel, of which Iran had ordered 31, with deliveries expected by early 1982. In total, just 25 dummy and captive training Shrike missiles were delivered to Iran, while the delivery of 975 operational Shrikes and all 31 F-4Gs was cancelled in February 1979 in the wake of the Islamic Revolution.

All six of the "Weasel Diesels" were allocated to the 11th Combat Command Training Squadron

(CCTS), with which all the IIAF's F-4Ds served, in 1977. A group of ten (possibly 12) F-4 instructor pilots of the 11th CCTS were despatched to the USA to complete courses on operating the AN/APS-107 for the launch of Shrikes and the Zot Box for use with Paveway LGBs. Wild Weasel pilots and WSOs and their LGB/Zot Box counterparts underook separate courses. All were experienced instructor pilots of high rank (Majors and Colonels) who were intended to train the future pilots and WSOs of the IIAF's projected force of F-4Gs. Tragically, most of these pilots were purged after the Revolution.



THE IRAN-IRAQ WAR

When the Iran-Iraq War officially started on September 22, 1980, the 11th CCTS had 26 F-4Ds on strength, including all six of the Wild Weasels. Of these 26, two were undergoing depot maintenance at IACI; two were undergoing Phase maintenance at their home unit; two were grounded awaiting spare parts and two were partly mission-capable (PMC) because their AN/APQ-109A fire-control radars were inactive, leaving 18 deemed fully mission-capable (FMC).

In the weeks leading up to the Iraqi Air Force strikes against Iranian air bases that officially started the conflict, the IRIAF had ordered that ten F-4D/Es and four F-5Es be kept on quick reaction alert (QRA) at the 1st TFB at Mehrabad. Of these, two of the F-4Ds and four of the F-4Es were each armed with four AIM-9J and four AIM-7E-2/4 AAMs and loaded SUU-23 gun pods (for F-4Ds), and were on standby for night QRA

IRAN'S McDONNELL DOUGLAS F-4D PHANTOM IIs

| C/n | USAF serial | 1st IIAF serial (1969–72) | 2nd IIAF serial (1972–75) | 3rd IIAF/IRIAF serial (1975 onwards) |
|-------------|-----------------|------------------------------|------------------------------|---|
| 3031 | 67-14869 | 3-601 | 3-663 | 3-6690* |
| 3050 | 67-14870 | 3-602 | 3-664 | 3-6691 |
| 3071 | 67-14871 | 3-603 | W/o 25.9.69 | — |
| 3090 | 67-14872 | 3-605 | W/o 9.2.71 | — |
| 3109 | 67-14873 | 3-604 | 3-665 | 3-6692 |
| 3128 | 67-14874 | 3-606 | 3-666 | 3-6693 |
| 3152 | 67-14875 | 3-607 | 3-667 | 3-6694 |
| 3171 | 67-14876 | 3-608 | 3-668 | 3-6695 |
| 3198 | 67-14877 | 3-609 | 3-669 | 3-6696* |
| 3213 | 67-14878 | 3-610 | 3-670 | 3-6697 |
| 3229 | 67-14879 | 3-611 | 3-671 | 3-6698 |
| 3247 | 67-14880 | 3-612 | 3-672 | 3-6699 |
| 3263 | 67-14881 | 3-613 | 3-673 | 3-6700* |
| 3280 | 67-14882 | 3-614 | 3-674 | W/o pre-1975 |
| 3296 | 67-14883 | 3-615 | 3-675 | 3-6701* |
| 3311 | 67-14884 | 3-616 | 3-676 | 3-6702 |
| 3323 | 68-6904 | 3-617 | 3-677 | 3-6703 |
| 3340 | 68-6905 | 3-618 | W/o 30.1.72 | — |
| 3357 | 68-6906 | 3-619 | 3-678 | 3-6704 |
| 3371 | 68-6907 | 3-620 | 3-679 | 3-6705 |
| 3388 | 68-6908 | 3-621 | 3-680 | 3-6706 |
| 3403 | 68-6909 | 3-622 | 3-681 | 3-6707* |
| 3417 | 68-6910 | 3-623 | 3-682 | 3-6708* |
| 3426 | 68-6911 | 3-624 | 3-683 | 3-6709 |
| 3525 | 68-6912 | 3-625 | 3-684 | 3-6710 |
| 3535 | 68-6913 | 3-626 | 3-685 | 3-6711 |
| 3545 | 68-6914 | 3-627 | 3-686 | 3-6712 |
| 3555 | 68-6915 | 3-628 | 3-687 | 3-6713 |
| 3564 | 68-6916 | 3-629 | 3-688 | 3-6714 |
| 3574 | 68-6917 | 3-630 | 3-689 | 3-6715 |
| 3583 | 68-6918 | 3-631 | 3-690 | 3-6716 |
| 3592 | 68-6919 | 3-632 | 3-691 | 3-6717 |

* Converted to *Wild Weasel* configuration during 1976–77

Survivors marked in **red**

MCDONNELL DOUGLAS



BELOW The second of the IIAF's Diesels to be delivered, 3-602 is seen here circa 1970–71 fitted with a centreline-mounted SUU-23 gun pod, a version of the M61 Vulcan cannon, fitted with a load of 1,200 x 20mm rounds and with a rate of fire of 6,000 rounds per minute. This F-4D served with both the IIAF and the post-Revolution IRIAF.

TAH ARCHIVE





ABOVE A rare photograph of an IRIAF Diesel in flight, in this case 3-6694, armed with an SUU-23 gun pod and a pair of wing-mounted 370 US gal fuel tanks, during a sortie over Kerman in central Iran, in January 1992. The IRIAF's Diesels continued to serve in the wake of the Revolution — although spares became increasingly hard to come by.

duties. Two similarly armed F-4D Wild Weasels were also on standby to act as laser designators for two LGB-loaded F-4Es on QRA. Each of the latter F-4Es was armed with a pair of GBU-10 LGBs, two AIM-7E-4 AAMs and a single AN/ALQ-101 electronic countermeasures (ECM) pod.

In the first six months of the conflict the F-4Ds of the 11th CCTS, in concert with the unit's F-4Es, were used extensively for special operations with two specific aims: the destruction of strategic bridges and ports in Iraq. During these precision-bombing missions a Zot Box-equipped F-4D Wild Weasel would illuminate the target with its ALD, for a second Phantom to drop one or a pair of GBU-10 LGBs on the target. Any error made by the F-4D's pilot or WSO could lead to the ordnance going astray and result in total failure of the mission. Therefore the ALD-equipped F-4D had to fly straight and level until the bomb hit its target, leaving the Wild Weasel extremely vulnerable to enemy surface-to-air missiles (SAMs). Three Wild Weasel F-4Ds were lost under such circumstances in the first few weeks of the war, leading to the cessation of all laser-bombing missions in the second month of the war.

Equipped with the AN/APQ-109A fire-control radar suite with a maximum detection range of 68 miles (110km), the F-4Ds were mostly used for night ground-controlled interception (GCI) duties and combat air patrols (CAPs) during the first six months of the war. The politically motivated purging of experienced pilots continued, making it necessary to speed up training activity, with the

101st CCTS, in 1981. Consequently, several back-seat WSOs were trained by the unit to become pilots. As a result, six or seven F-4Ds were allocated for training, becoming only PMC, with their radars and other mission systems inactive, as they were to be used only as trainers. From the mid-1980s most of the F-4D force became PMC, as parts for the AN/APQ-109 radar system became increasingly scarce. In the last years of the war, F-4D participation was reduced to close air support missions.

POST-WAR SERVICE

The IRIAF reportedly lost nine (possibly 11) F-4Ds during the Iran-Iraq War, leaving a possible 17 in service with the 11th CCTS when the conflict ended, at which point almost half were grounded or undergoing overhaul at IACI. With the exception of the three or four used for QRA duties, the remainder of the airworthy F-4Ds had become PMC owing to a lack of spare parts for their radar equipment, and were used only for pilot training. In 1989, to better protect Tehran, the IRIAF's Commander-in-Chief, Gen Mansour Sattari, ordered the relocation of the 11th CCTS from the 1st TFB at Mehrabad to the 10th TFB at Chabahar, a few months before the arrival of the Soviet-supplied MiG-29 single- and two-seaters that would equip the newly formed 11th TFS at Mehrabad. The F-4Ds were then used to form the 101st CCTS/TFS at Chabahar.

In the mid-1990s the 101st CCTS/TFS still had three to four fully mission-capable AIM-7E-



ABOVE Iran's most venerable F-4D — and the oldest Phantom still in operational service anywhere in the world — serial 3-6690 taxis out at Mehrabad for a Functional Check Flight (FCF) on July 27, 2019. **BELOW** Another IRIAF Phantom crew patch, this example reflecting the Diesel's use as a delivery system for the GBU-10 Paveway LGB.

equipped Diesels on strength for QRA duties, until the last stock of spares for their ageing AN/APQ-109A radars ran out, forcing the IRIAF to start work on restoring the radars under the self-sufficiency programme Project *Alborz*. Despite initial success with the restoration of two radars, the project was abandoned in the late 1990s and a decision was made to use the F-4Ds for training only. By the early 2000s only two Diesels remained combat-capable, able to use AIM-9J Sidewinder infra-red AAMs and unguided "dumb" bombs. These could be used for daytime QRA missions, but the base had no F-4Ds capable of undertaking interception at night or in all-weather conditions.

HUNTING TERRORISTS

A chronic lack of experienced technicians and even maintenance tools degraded the remaining combat-capable F-4Ds to a point at which they were unable to drop iron bombs or carry gun pods for even the most basic air-to-ground missions; the wiring and connectors of their inboard pylons had become filled with dust and rainwater. The weapons systems were largely non-functional and unable to release any kind of bomb or operate rocket launchers, even for weaponry training.

In 2005 the IRIAF's Deputy of Self-Sufficiency Jihad & Industrial Research was tasked with refurbishing the wiring of the F-4Ds with a view to restoring their limited combat capability, making them able to use basic weapons such as unguided bombs, gun pods and AIM-9J AAMs. As a result, three Diesels scheduled to be sent to IACI for depot maintenance or overhaul were instead

handed over to the F-4 Overhaul Centre at the 1st TFB at Mehrabad. Had IACI been contracted to complete the work, it was estimated that it would have cost the IRIAF almost \$300,000, whereas the 1st TFB's F-4 Overhaul Centre would complete the work for nothing. Over the next four years, the Centre returned Diesels 3-6690, 3-6705 and 3-6713 to at least a basic combat-capability.

This restoration work proved invaluable for the Iranian Police and Islamic Revolutionary Guard Corps (IRGC) Ground Forces when they were in need of close air support during anti-terrorism operations against the *Al-Qaeda*-affiliated *Jundollah* terrorist group near Zahedan in Baluchestan, eastern Iran, on October 15, 2008. Two of the combat-capable F-4Ds of the 101st CCTS/TFS provided close air support for security forces and dropped Mk 82 unguided bombs on terrorist positions.



THE COST OF NO SPARES

The IRIAF lost six F-4Ds in accidents during 1994–2018, the most recent of which occurred on July 8, 2018. The Phantom, serial 3-6702 (67-14884), which had been redelivered to the 101st CCTS/TFS after overhaul by IACI only four days previously, crashed owing to technical failure caused by the use of low-quality spares while undergoing depot maintenance. Instructor pilot Maj Tahmasbi and student pilot 1st Lt Morad-Beki both used the ejection seats, but were seriously injured owing to the low altitude at which they ejected.

On January 12, 2016, the 101st CCTS/TFS lost



ABOVE *Diesel 3-6702 arriving at Mehrabad on October 20, 2008, for overhaul at Iranian Aircraft Industries (IACI). In September 1976 a pair of IIAF Phantoms were scrambled to intercept “lights in the sky” over Tehran, one of the F-4s suffering electrical failure in flight; it was later thought to be a meteorite shower, rather than aliens over Iran.*

3-6705 (68-6907) when both of its General Electric J79-GE-15 engines failed. The Phantom was being flown by student pilot 1st Lt Ali Bloorkhani and instructor Col Hamid Afifi-Pour. To save their by now somewhat precious aircraft, the pilots had chosen to perform an emergency landing on an empty road; suddenly a pick-up truck appeared in front of them, forcing Bloorkhani to lift the aircraft's nose, culminating in a stall and subsequent crash. Both pilots ejected at the moment the Phantom struck the ground, sadly resulting in the death of Bloorkhani on impact and Afifi-Pour in the ambulance on the way to hospital. The Phantom had undergone its last overhaul, performed by IACI, in 2013, with redelivery to the IRIAF after completing problem-free check flights on June 30 that year.

In 2020 eight F-4Ds remain in service with the 101st CCTS/TFS at the 10th TFB, “Delhamed Brothers”, at Chabahar. All remain in use for training pilots of the F-4Es and RF-4Es, of which the IRIAF continues to operate some 60 examples.

ARASH REZAIEE VIA AUTHOR

The unit's sister squadron, the Dassault Mirage F1EQ/BQ-equipped 102nd TFS, is responsible for providing dissimilar-type and adversary air combat training for the F-4D pilots.

THE PHUTURE?

As none of the F-4Ds and Mirage F1s are fully mission-capable, the 101st and 102nd TFSs have no QRA aircraft; therefore the responsibility for the protection of airspace over eastern and south-eastern Iran falls to the 91st TFS at the 9th TFB, “Abdolkarimi”, at Bandar Abbas. Any unidentified aircraft violating Iranian airspace from the south-east are detected by the early-warning radar equipment of the Iranian Air Defence Force (IRIADF), which then scrambles two 91st TFS F-4Es to deal with the intrusion. When there is an Iranian military exercise in the Gulf of Oman or south-eastern Iran, or when the Iranian Navy is deployed on manoeuvres in the region, the IRIAF deploys a pair of 91st TFS F-4Es to the 10th TFB at Chabahar for QRA duties.

Four IRIAF Phantoms on display a few days before Iran's Military Day Parade at the 3rd TFB at Hamedan in April 2008. Nearest the camera is Diesel 3-6705, which crashed following an attempt to land on a road after engine failure on January 12, 2016.





ABOVE Another picture of 3-6702, this time before an Instrument Flight Training Mission at the 10th TFB, "Delhamed Brothers", at Chabahar, in October 2014. Sadly, on July 11, 2018, '6702 was destroyed in a crash a few days after its re-delivery to the IRIAF from IACI following a major overhaul.

RIGHT One of the last eight Diesels still in IRIAF service, 3-6693 is seen here undergoing major maintenance work at the F-4 Overhaul Centre at Mehrabad in February 2019. Following its refurbishment to limited combat-capability, '6693 made its first post-overhaul check flight on May 16, 2019.

Of the eight surviving F-4Ds in IRIAF service, five are airworthy, two are undergoing overhaul and one, 3-6697, has been in storage at Chabahar since 2013 and has been regularly cannibalised for spares. Many of its parts were used for the restoration of 3-6699, which was put into storage in 1999, but returned to airworthy status in 2014.

The current airworthy F-4Ds in 2020 are 3-6690; 3-6693; 3-6700; 3-6710 and 3-6711. Their recommended times between overhaul (TBOs) expire in January 2024, December 2023, August 2021, March 2020 and January 2023 respectively.

The two Diesels currently undergoing major overhauls are 3-6699 and 3-6714. The latter, the first F-4D to be upgraded and undergo a lifetime-extension programme as part of Project *Dowran* during 2010–12, is undergoing overhaul at IACI and will be redelivered to the 101st CCTS/TFB in February or March 2020. The other F-4D undergoing overhaul at the time of writing (August 2019) is 3-6699. The IRIAF F-4 Overhaul Centre at the 1st TFB has completed a change of wiring and restored '99's combat capability for the use of gun and rocket pods, as well as the ability to drop iron bombs.

Unable to procure new combat aircraft from any prospective source owing to the United Nations' (UN) arms embargo, and also because of the limited budget available to the Iranian



armed forces, the IRIAF is scheduled to continue using its small force of F-4Ds for the training of its F-4E/RF-4E pilots for at least another decade by means of gradually upgrading and extending the life of the airframes. In addition to these eight Diesels, the IRIAF also operates up to 60 F-4E/RF-4Es with the 31st, 61st and 91st TFSs, as well as the 31st Tactical Reconnaissance Squadron at the 3rd, 6th and 9th TFBs respectively. Should the UN revoke its sanctions on Iran (although this seems extremely unlikely for the foreseeable future), the Phantom force will be replaced by Russian-supplied Sukhoi Su-35S/Su-30SM multi-role fighters, which Iran has been expressing an interest in procuring since 2016.



IRAN'S LAST EIGHT SURVIVING F-4D "DIESELS"



IRIAF serial 3-6690 (67-14869, c/n 3031)

This aircraft was the first F-4D to be delivered to the Imperial Iranian Air Force (IIAF) and one of the two surviving "Wild Weasel" variants still in service. Its APS-107 RHAW system, intended for use in training future IIAF F-4G pilots and WSOs, is now inactive; it remains installed but has not been serviced for some time. Its weapons system, however, has been operational for weapons training courses since 2005, when it was rewired by the IRIAF's Deputy of Industrial Research & Self-Sufficiency Jihad during depot maintenance at Mehrabad. Since 2010, when its recommended Mean Time Between Overhaul (MTBO) expired, the aircraft has been overhauled by IACI, which received the machine for overhaul on October 12, 2010. The major overhaul was completed in February 2013, when it was re-delivered to the 101st CCTS/TFS. In 2017 the aircraft was returned to IACI for overhaul again, after which it logged a post-overhaul check flight on July 27, 2019, and was flown back to Chabahar four days later. The aircraft logged its first post-2019-overhaul flight with the 101st CCTS/TFS on August 5, 2019.

IRIAF serial 3-6693 (67-14874, c/n 3128)

After some 20 years in storage, 3-6693, which had also been cannibalised for spares at the 10th TFB, was handed over to the 101st Maintenance Squadron to be restored to airworthy condition as an attrition replacement for 3-6705, which crashed on January 12, 2016. Restoration was completed in 2018, when the aircraft was ferried to Mehrabad to be overhauled at the IRIAF's F-4 Overhaul Centre. Its wiring was replaced and its limited combat capability — rocket and gun pods and iron bombs — was restored. The aircraft logged a functional check flight (FCF) on May 16, 2019, and was re-delivered to the 101st CCTS/TFS a few days later.

IRIAF serial 3-6697 (67-14878, c/n 3213)

On July 28, 2008, this aircraft was flown from Chabahar to be handed over to IACI for overhaul of its airframe and J79-GE-15 engines. It was overhauled and re-delivered to the 101st CCTS/TFS in 2009. Its MTBO expired in 2013 and the aircraft was put into storage at the 10th TFB. It was then cannibalised for spares to be used for the restoration of 3-6699.

IRIAF serial 3-6699 (67-14880, c/n 3247)

With the loss of F-4D serial 3-6713 in 2011, the 101st Maintenance Squadron was tasked in 2012 with restoring one of the 101st CCTS/TFS's two "hangar queen" F-4Ds as a replacement. The machine chosen was 3-6699, which had been put in storage in 1999 and was regularly cannibalised for spares. Restoration was completed in 2014 and the aircraft logged an FCF after some 70,000 man-hours of maintenance work at Chabahar on August 28, 2014. The aircraft was then re-delivered to the 101st CCTS/TFS for training duties as its weapons system was non-operational. In January 2019 the aircraft was delivered to the F-4 Overhaul Centre at Mehrabad for depot maintenance and a rewiring and restoration of its weapons system.

IRIAF serial 3-6700 (67-14881, c/n 3263)

The second surviving Wild Weasel variant, although its APS-107 RHAW is non-operational. This aircraft was the second IRIAF F-4D to undergo a lifetime-extension programme as part of Project *Dowran*, which included refitting the aircraft with new structural parts produced at IRIAF's Owj complex in eastern Iran. The aircraft was overhauled by IACI in 2009, completing its FCF on December 19 of that year. The aircraft was completely rewired and its weapons system restored for gun- and rocket-pod and unguided bomb use. After lifetime-extension work and depot maintenance at IACI, the aircraft completed an FCF on February 25, 2017.

IRIAF serial 3-6710 (68-06912, c/n 3525)

One of five airworthy F-4Ds on strength with the 101st CCTS/TFS at time of writing (August 2019). Overhauled by IACI in 2009, the aircraft underwent a simpler airframe overhaul in 2015, completing an FCF on September 16, 2015. This machine was one of two F-4Ds based at the 10th TFB which participated in Exercise *Prophet Mohammad-4* with the Islamic Revolutionary Guard Corps Ground Forces on December 13, 2016. The aircraft's MTBO expires in March 2020 and will almost certainly be delivered to IACI or the F-4 Overhaul Centre for maintenance and overhaul.

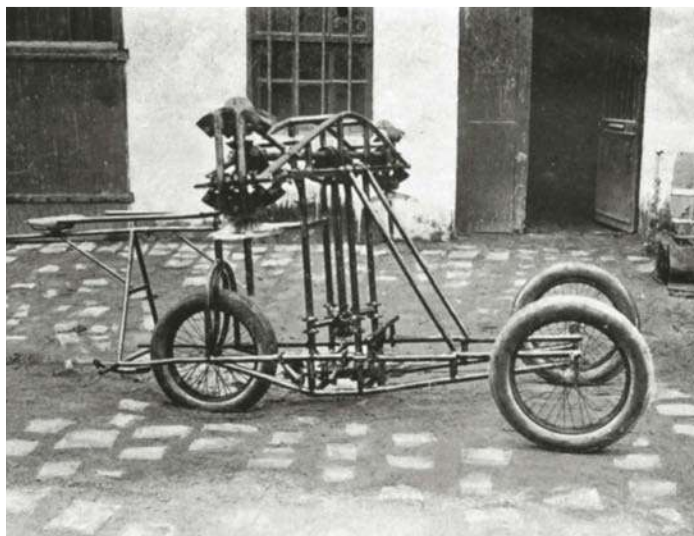
IRIAF serial 3-6711 (68-06913, c/n 3526)

In storage in Chabahar for most of the previous decade, this F-4D was restored to airworthy condition in 2013 for a ferry flight to Tehran in January 2014 for handing over to IACI for depot maintenance. Its overhaul lasted almost four years and its first post-overhaul FCF was logged on July 6, 2017. The aircraft was re-delivered to the 101st CCTS/TFS a few days later. Still in service; its next depot maintenance is scheduled for 2021.

IRIAF serial 3-6714 (68-06916, c/n 3564)

This Phantom was the second of the IRIAF's F-4s — and the first F-4D — to be upgraded and undergo the lifetime-extension plan as part of Project *Dowran* by IACI. For the latter the aircraft had its wiring completely replaced and was fitted with a new domestically produced Inertial Navigation System (INS). It was also equipped with a new U/VHF communication system, with two white "shark fin" antennae atop and beneath the fuselage. A new GPS antenna was installed and the aircraft had its outer wing and many structural parts replaced with material domestically produced at Owj. After its overhaul and upgrade, 3-6714 performed a fast-taxi at Mehrabad International Airport on January 19, 2012. Test pilots noticed technical issues which led to further maintenance work and the aircraft made its first FCF on 21 February 21, 2012, followed by a second on February 27. The aircraft was then released by IACI Quality Control for re-delivery to the IRIAF, which took place on March 16 the same year, when 3-6714, together with 3-6205, the first Mirage F1EQ to be overhauled by IACI, flew from Tehran to Dezful to participate in an airshow.

Compiled by Babak Taghvaei



*CE
HOMMES
MAGNIFIQUES...*

FRANCE'S AIR PIONEERS: ANTOINE P. FILIPPI

In the first part of a new series on “those magnificent Frenchmen” who risked their reputations, fortunes — and often lives — to further the cause of aviation across the Channel, French aviation historian **JEAN-CHRISTOPHE CARBONEL** takes a look at the aeronautical career of Antoine Filippi, who developed the Cynros rotating wing to propel vehicles across air, land, snow and river



ANTOINE PADOUE
Filippi's aviation
adventure began
on December 18,
1900, when he and
his business partner Charles Macler
performed a demonstration of "atmospheric
depression" in the Paris offices of *Le Figaro*.
In this experiment a rotating disc generated a
depression above it and the normal atmospheric
pressure underneath it generated lift, enough
to support a cork disc and a few coins. Famous
French aircraft designer Victor Tatin (1843–1913),
creator of the *Aéroplane* flying model in 1879,
was also present for the demonstration, but
was unimpressed and criticised the theories of
Messieurs Filippi and Macler.

The same experiment was repeated, again
by Filippi and Macler, in 1902, with little more
success, according to the journal of the Aéro-
Club de France, *l'Aérophile*: "This is just the
reworking of elementary school experiments
with cardboard, metal discs and cones". The
journal described the device as the "Cyclone"
but it was probably named "Cyrnos", the latter
being associated with all of Filippi's other
enterprises, particularly the "Cyrnos wing"
and the Cynoptère. Cyrnos is the ancient
Greek name for Corsica, making it a reasonable
assumption that Filippi was of Corsican descent.

Filippi was always seeking financial support,
and at some point he was sponsored by
Belgian artist Alfred Stevens. After the latter's
death in August 1906, Filippi was probably
forced to finance his own projects, although
French interior designer and sculptor Georges
Hoentschel also financed some of Filippi's
ventures, according to a later article in *Le Figaro*.
Charles Macler was probably Filippi's financier
for his early experiments.

THE "CYRNOS WING"

In 1906 Filippi patented in France "an ascending
surface for aeroplane or flying machine" defined
as "an ellipsoid, which edges are downturned
along a quarter of their periphery and slightly
upturned on the opposite side. These curvatures
are reproduced symmetrically on the other side.
This surface is attached to an inverted cone, the
flat base of which, equal to the diameter of the
smaller of the axes of the ellipse, is attached to
the ascending surface".

From such jargon one may distinguish the
essential premise of the "*aile rotative Cyrnos*" —
Cyrnos rotating wing — Filippi's alternative



to the conventional
propeller. Filippi had taken
measurements and postulated
that a conventional propeller
"loses up to 33 per cent of its

nominal thrust when the speed of
flight increases" and therefore promoted his
"rotating wing", larger near the centre than at
its extremities. Filippi's theory was that this
special design would generate a depression in
front of the propeller to "suck" the rotating wing
— and thus the attached aircraft — forward.
French technical journal *L'Année Scientifique et
Industrielle* described the working of the *Aile
Cyrnos* in its 1912 edition:

"Far from resembling a propeller, the central
part of which is considered inefficient, the
rotating wing is, on the contrary, wider at the
centre than at the tips. Usually it is elliptical in
planform with the edges being partly curved.
Rotation generates movement of the air, which
is drawn from the periphery, and a flow is
generated parallel and radially to the surface
of the wing, lowering the pressure above the
rotating wing while the pressure beneath the
wing is maintained through the centrifugal
action created by the shape of the wing. The
air above the wing is deflected in proportion
to the speed of the rotating surface, creating
a propulsive vortex. The faster the rotation of
the wing, the stronger the vortex. Therefore,
contrary to what happens with a propeller, there
is no limit to rotation speed except that imposed
by the materials used to construct the wing".

According to André Gueret in *Notes sur les
hélices aériennes*, published in 1911, Filippi
referred to this type of rotating wing as an "*hélice
centripète*" — centripetal propeller — but this
designation was rarely used; all reports from the
period refer instead to the *Aile Cyrnos* name.

THE CYNOPTÈRE

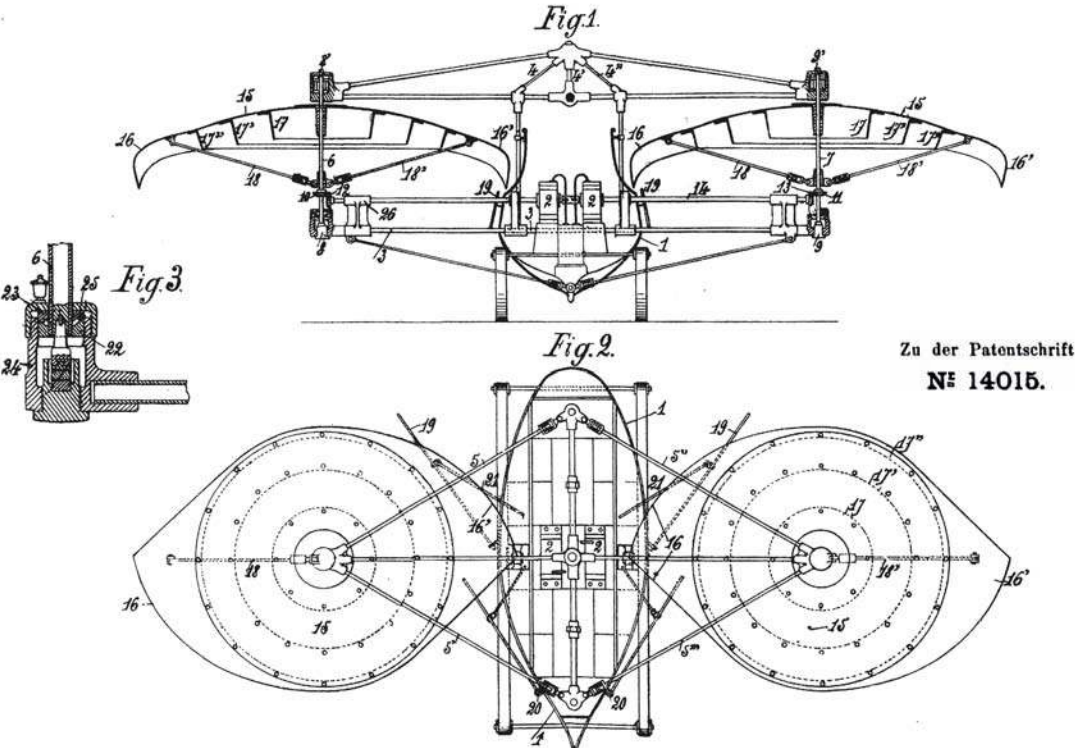
The idea of a machine capable of vertical take-off
had preoccupied Filippi since at least 1900, when
he was still living in Bizerte, Tunisia (by 1906 he
had moved to Paris). While in Tunisia he had
patented, in association with Macler, a vertically
rising machine based on his Cyrnos wing ideas.
Part of the patent application reads:

"This invention is based upon the principle
that by rapidly rotating a convex- or conical-
shaped body having a conveniently shaped
wing around its vertical axis, a displacement
of air pressure is produced. Owing to this
difference in air pressure beneath said rotating

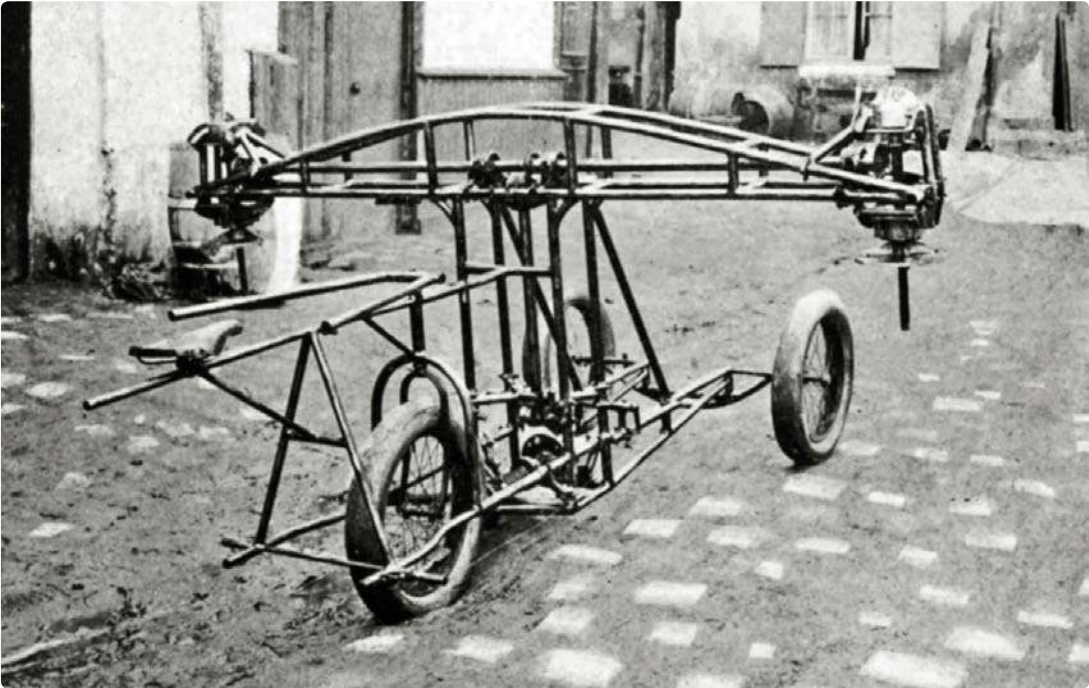
OPPOSITE PAGE, TOP LEFT One of Filippi's "*ailes rotatives*" — rotating wings — always referred to as such, and not as a propeller. **OPPOSITE, TOP RIGHT** A photograph of Filippi's 1907 "*Cynoptère*", probably never completed. **OPPOSITE, BOTTOM** Italian aviator Jules Nardini in his Cyrnos wing-propelled Deperdussin over Dover in 1912.

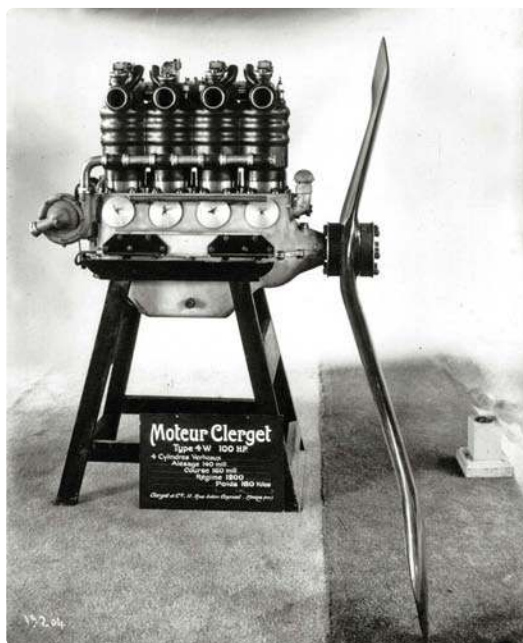
This illustration from a 1906 Austrian patent awarded to Filippi appears to show a rather complex early version of his Cynoptère idea, with a detail appearing to show the lower bearing for one of the rotor shafts. Unfortunately no key is available!

ANTOINE PADOUE FILIPPI IN PARIS.
Lenkbarer Flugapparat.



BELOW Another view of Filippi's incomplete 1907 Cynoptère, a three-wheeled flying-car/readable flying-machine with apparently little more than a bicycle saddle for accommodation. According to contemporary reports, this machine incorporated a form of "tilt-rotor" capability — but it is extremely unlikely that it proceeded any further.





LEFT A Cynos wing attached to a Clerget 100 h.p. four-cylinder engine at the Salon Aéronautique de Paris in 1911. Note the almost gullwing-like configuration of the two-bladed wing, somewhat different from the fat-sectioned examples fitted to and test-flown on various aircraft, most notably Robert Grandseigne's Caudron biplane in December 1910.

FILIPPI CYRNOPTÈRE 1912 DATA

Powerplant 1 x 200 h.p. Clerget V8 piston engine driving 2 x "Cynos wings"

Lifting power* 800kg (1,760lb)

Span 4.0m (13ft 1½in)

Take-off weight incl. pilot 600kg (1,320lb)

* Estimated

Source: *Le Matin*, November 5, 1912

body, an ascending motion is imparted thereto, providing that the effort produced is superior to the weight of the apparatus."

In 1905 the 8ème Exposition de l'Automobile, du Cycle et des Sports, organised by the Automobile Club of France, was held at the Grand Palais in Paris, and at which, according to *l'Aérophile*, "a model of Mr Filippi's flying-machine" was displayed. It was not until 1907, however, that Filippi built his first aeroplane "in the shape of a bird", according to *L'Auto* magazine, which described it as having a metal fuselage with two wings "like the blades of a huge propeller". In the middle of each wing, in a circular opening 130cm (51in) wide, protected by a wire cage, an electrically driven propeller enabled the machine to take off like a helicopter. The propellers could be orientated at will to control the machine and propel it on a horizontal axis. Filippi's ambition was at that time to build a flying car in the modern sense — a vehicle which could operate both on the road and in the air.

Work on this flying-car contraption did begin. Photographs of the machine show a seat at the rear of the tubular frame. Filippi named it the "Cyrnoptère" and intended to use Cynos

wings for the rotors. Filippi had apparently been pursuing the idea for some time, as proved by a French patent issued to him in 1903 for a "controllable" flying machine similar to the three-wheeled Cyrnoptère. In this version the Cynos rotors are linked to the engine via a meshed axle. The rotors do not appear to be tiltable in this version, but this machine was only intended to fly, not drive along roads. It seems that this flying-car version did not proceed much beyond the frame shown in the photos.

A Cyrnoptère proof-of-concept testbed was constructed, however, by Malicet et Blin, a car and bicycle manufacturer in Aubervilliers, a suburb of Paris. A contemporary news report claims that "early tests show that the machine [can] lift 700kg [1,540lb] in addition to the electric apparatus", adding that "no information has been provided regarding the power source used for these tests". It is probable that, like most electrically powered helicopter experiments of the day, this machine was powered by ground-based batteries. There is no reference to it being manned. It appears that one result of the first series of tests was Filippi's realisation that the aeroplane wings were redundant, and that dispensing with them saved weight.

In 1911 another patent was issued to Filippi, describing a "hélicoptane" (a term also used by French rotary-wing pioneer Paul Cornu for an aborted tilt-rotor design). In this patent Filippi expanded on his idea that rather than screwing itself into ambient air and thus propelling the aircraft, his Cynos-wing rotor concept created a hollow depression in the air above it, which "sucked" the aircraft forward. In this version the depression could be filled by a "fluid" (presumably air) pumped through the rotor axis.

At the 4ème Exposition Aéronautique, held in the Grand Palais in late 1912, a reworked variant of the testbed was exhibited. It was described as using a 200 h.p. Clerget inline engine driving two Cynos wings of 4m (13ft 1½in) diameter. The only known photograph of the machine, on a period postcard, does not really help in describing the machine, which also appears to be unmanned, other than that the rotor axes do not appear to be tiltable.

TESTING THE CYRNO WING

In December 1910 the Cynos wing was first tested in flight on an aeroplane. On the first of the month, a 2m (6ft 6in)-diameter Cynos wing



LEFT One of the Cynos wings fitted to Robert Grandseigne's Caudron in December 1910. The caption accompanying this picture in the March 4, 1911, issue of *Flight* states that "the design is due to M Filippi, and appears to be based on the assumption that the two blades may together be considered as analogous to one aeroplane".

BELOW A front view of the Charles Roux monoplane fitted with a Cynos wing. Antoine Filippi is not to be confused with Italian Navy officer Ludovico de Filippi, who obtained his pilot brevet in France in 1910, and who went on to become the first commander of the Italian Navy's Servizio Aviatorio.

to Grandseigne's Caudron, was first reported in British weekly *Flight* in its March 4, 1911, issue.

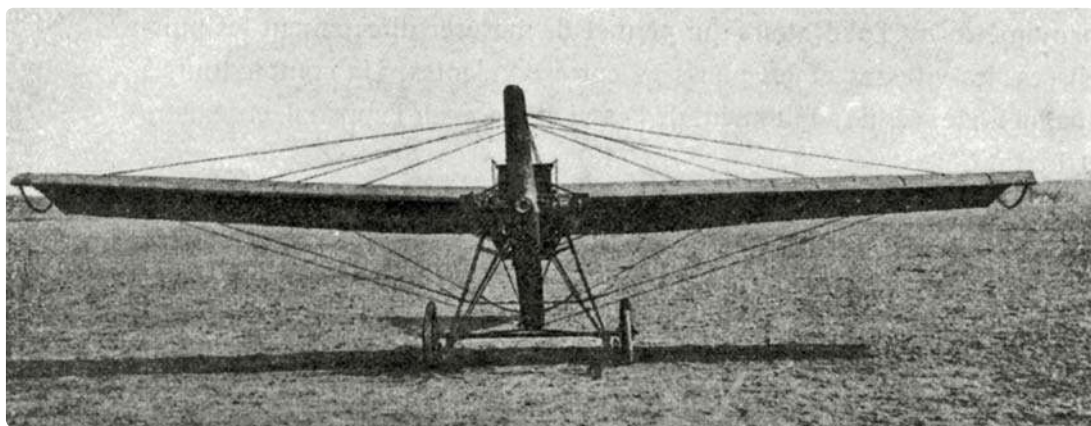
On January 4, 1911, more tests were undertaken, this time with a biplane designed by Emile Paumier. In April the first *Avions Charles Roux* (ACR) metal monoplane was used to test the Cynos rotary wing, and first flew with a Cynos wing on April 13, 1911. Roux subsequently established the *Compagnie Internationale de Navigation Aérienne* (CINA) to sell his aeroplane designs.

Later, more tests with the Cynos wing were completed aboard the "flying laboratory" aircraft operated by Louis Gaudart and Jean Legrand. This was essentially a 45/50 h.p. Gnome-powered Voisin biplane fitted with Richard recording equipment to capture flight data. During these test flights over Juvisy (Port-Aviation), speeds of up to 65km/h (40 m.p.h.) were recorded. Gaudart then installed the Cynos wing on his own machine, a monoplane powered by the same Gnome engine used on the flying laboratory, reaching a claimed speed of 100km/h (62 m.p.h.) in the machine.

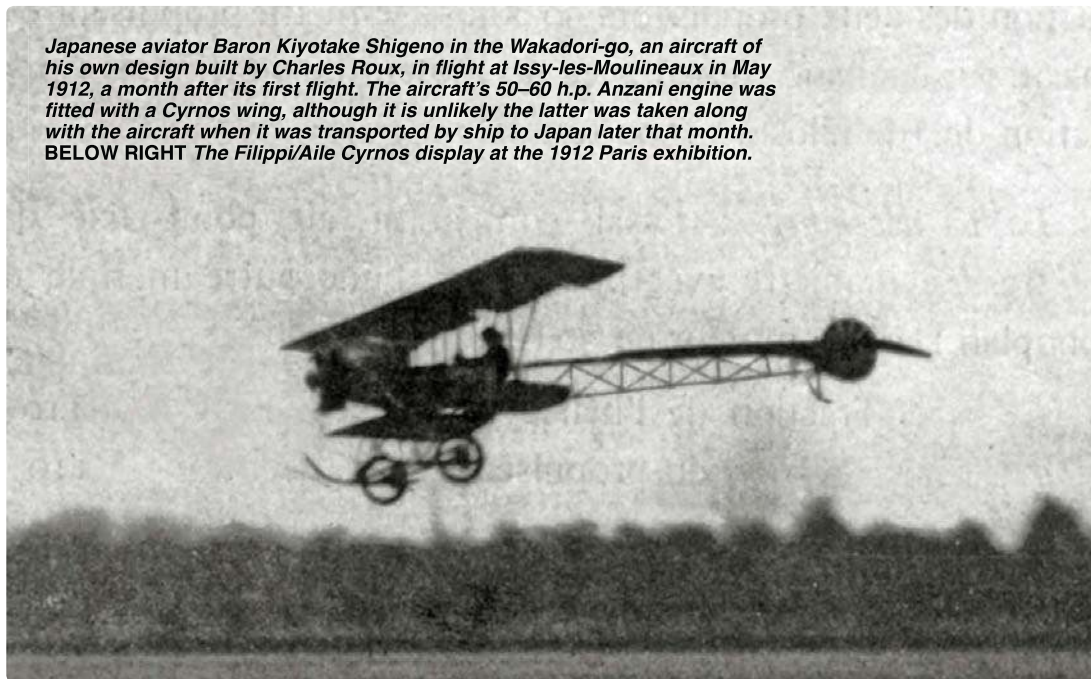
In the second half of 1911 Italian aviator Jules Nardini fitted a Cynos wing to his Déperdussin-Anzani, which he then tested at Reims. In its January 20, 1912, issue, *la Revue Industrielle* reports a test flight made by a Déperdussin-Anzani — no date or location is indicated — in which a speed of 100km/h was measured between two points, probably referring to

was installed on a Caudron biplane owned by Robert Grandseigne at Issy-les-Moulineaux, near Paris. The machine was fitted with a 20/25 h.p. Grégoire-Gyp engine and managed to take off despite the engine being "in poor shape". Cynos wings of various diameters were ground-tested on December 8, 14 and 15, 1910. On the 17th, Grandseigne's Caudron was again successfully put to use, this time to test a 1.9m (6ft 3in)-diameter Cynos wing.

On December 31 Grandseigne flew another Caudron fitted with an Anzani engine driving a 2m-diameter Cynos wing. According to a brochure prepared by Filippi, the aircraft reached a speed of 100km/h (62 m.p.h.) over Issy-les-Moulineaux. The same aircraft was refitted with a 2.4m (7ft 10½in)-diameter Cynos wing and flown again, but this time with "less satisfying results". The Cynos wing, as fitted



Japanese aviator Baron Kiyotake Shigeno in the Wakadori-go, an aircraft of his own design built by Charles Roux, in flight at Issy-les-Moulineaux in May 1912, a month after its first flight. The aircraft's 50–60 h.p. Anzani engine was fitted with a Cynos wing, although it is unlikely the latter was taken along with the aircraft when it was transported by ship to Japan later that month. BELOW RIGHT The Filippi/Aile Cynos display at the 1912 Paris exhibition.



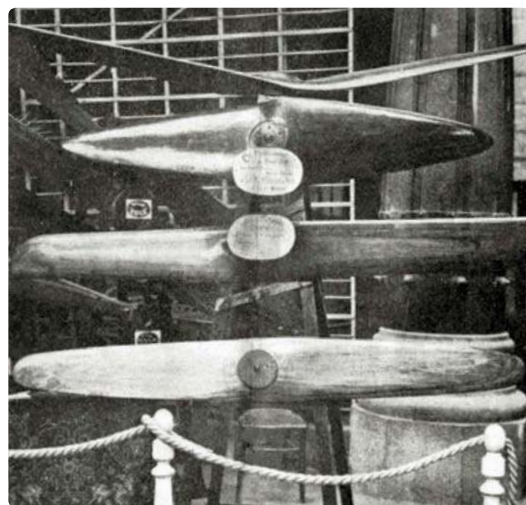
Nardini's early test flights. These trials were evidently successful, as, when he arrived in the UK in May 1912, Nardini had brought his Cynos-equipped aircraft, as reported in *Flight* in its May 25, 1912, issue:

"On Monday the 13th Jules Nardini, who had arrived from Calais the day before in his Gnome-Deperdussin fitted with the new Cynos propeller, or rotary wing, as the inventor, M Filippi, calls it, made a fine flight over [Dover] town and harbour and excited keen interest among spectators. Sunday last he was again out and made a wide circuit round St Margaret's and Whitfield, but the wind was treacherous and obliged him to come down after about twenty minutes' flight."

In July that year Nardini was still exhibiting his machine in the UK, *Flight* reporting that "on his 50 Gnome Deperdussin he uses one of those curious 'Cynos' rotary-wing propellers which seems to give very good results". On September 26 it was reported that Nardini undertook some "night flying" above Bournemouth with an "illuminated aircraft", but it is unclear if the Cynos propeller was installed for this occasion.

This is not the end of the Cynos propeller in the UK, however, as a letter from free-flight modelmaker Mr Harold T. Holman in the December 6, 1913, issue of *Flight* attests:

"I am sending you some sketches of a form of propeller which I think is admirably suited for tractor models [i.e. with a "pulling" propeller at the nose — Ed.]. It is modelled upon exactly the same lines as the remarkable 'Aile rotative Cynos' which was used with so much success by Signor Nardini on the Deperdussin monoplane



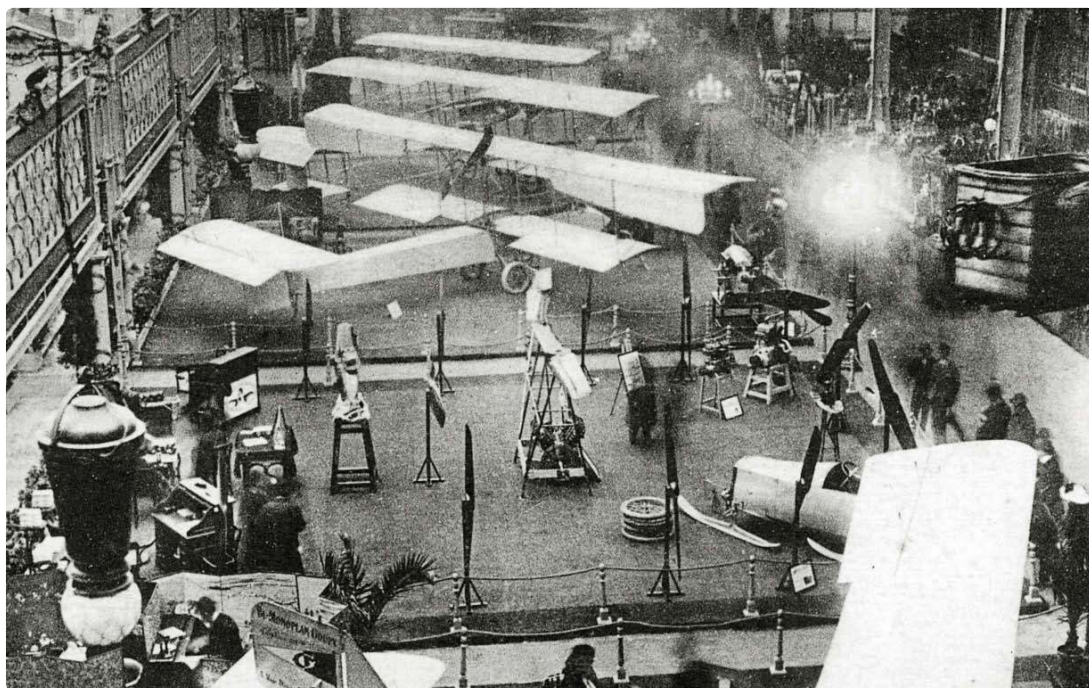
on which he crossed the Channel.

"He very kindly gave me a model of his 'rotating wing', as it is termed, and I obtained such good results with a copy that I constructed, that I thought you would be interested to have some particulars of it.

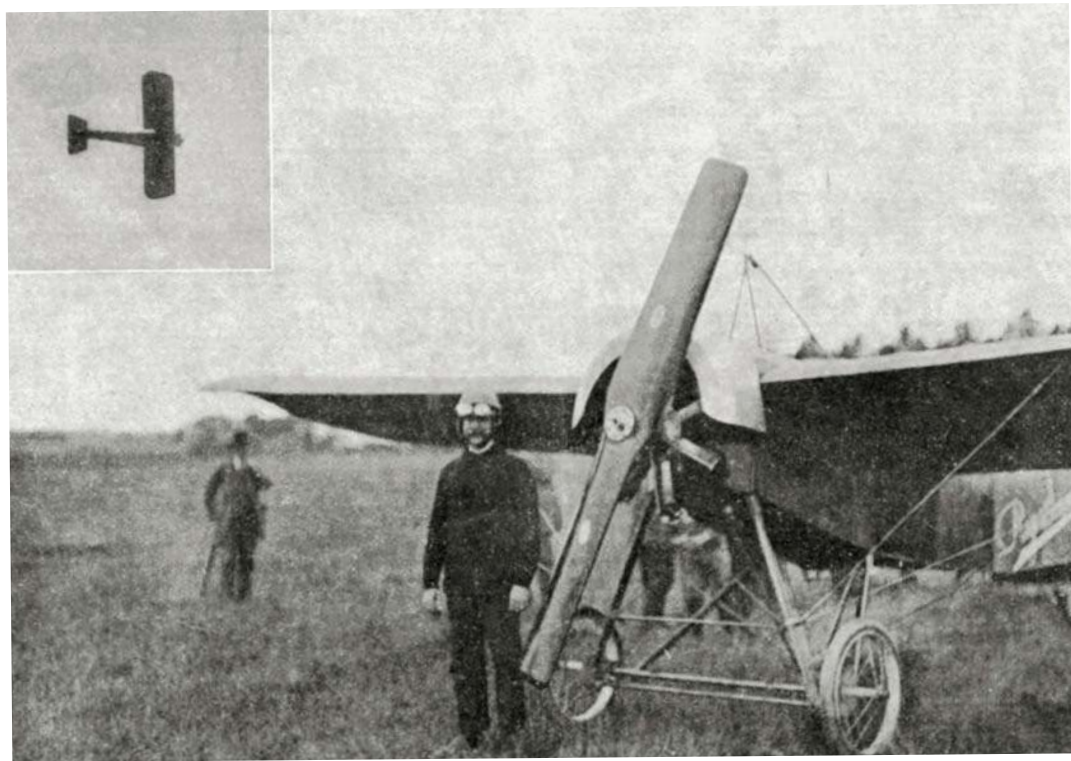
"The shape is somewhat singular, the blade tapering from about $1\frac{3}{4}$ in at the boss to $\frac{7}{8}$ in at the tip. It is also tapered (viewed edge-on) so as to ensure a constant pitch along the whole length of the blade. In section the blade is like the section of a monoplane wing reversed, i.e. the dipping edge tail, instead of leading this shape, seems to give a stronger pull than an ordinary flat or slightly hollowed-out blade, whose section is the arc of a circle. There are



ABOVE Jean-Julien Champagne (right) and Henri Steineur, Bertrand de Lesseps' mechanic, alongside the 1911 sleigh-cum-car Champagne reputedly designed for de Lesseps, fitted with wheels and a Cynos wing at the rear for propulsion. The curious grooved pattern on the wing was a modification conceived by de Lesseps himself.



ABOVE This contemporary postcard shows the CINA display enclosure at the 1912 Exposition Aéronautique in Paris, with the sleigh, on Nivert articulated skis, partly obscured by the wing at bottom right. The Cynoptère testbed is in the centre, with a collection of Cynos wings on stands scattered throughout CINA's display.



ABOVE On September 5, 1912, Léon Bathiat reached a height of 1,000m (3,300ft) in a Sommer monoplane fitted with a Cyrnos rotating wing, as seen here. Two months later he was at it again, reaching 3,000m (10,000ft) in 42min on November 16, although it is likely the Sommer was fitted with a more conventional propeller on that occasion.

points about this propeller which tend to make 'tractor-planing' easier, for: 1) the shape renders it easy to construct; 2) it has far less tendency to snap off at the boss; 3) these, I think, will greatly help the novice who is taking up tractor-planing as a hobby, and who is not very proficient in propeller and tractor construction."

BY AIR, LAND, SNOW AND RIVER

At Reims on July 20, 1911, a Cyrnos wing was mounted on a Hanriot monoplane fitted with a 100 h.p. rotary engine. These tests were undertaken with the aircraft attached to a dynamometer while suspended above the ground. Another round of testing was completed at the *Conservatoire National des Arts et Métiers* in Paris on May 8, June 20 (two test runs) and June 21, 1912. More than 40 tests were completed with different types of "wings" of various diameters.

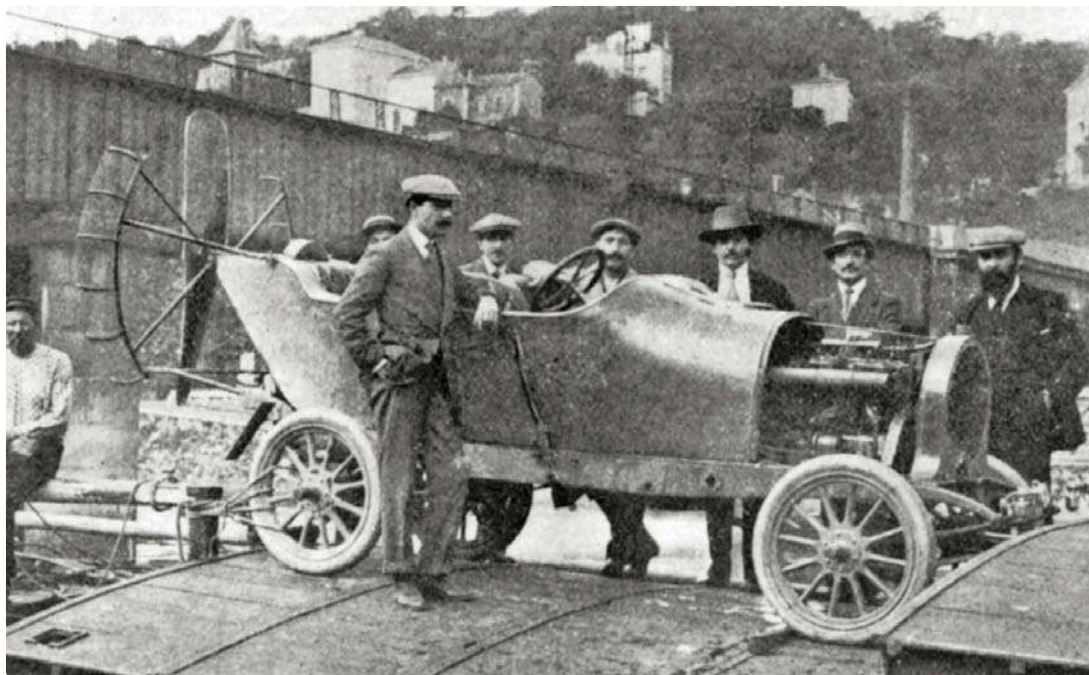
In the years before the Great War, propeller propulsion for cars was promoted by a handful of inventors, the best known being Marcel Leyat, who began testing his *Hélicocycle* in 1913. Before that, Olympian fencer Bertrand de Lesseps, son of French diplomat Ferdinand de Lesseps, had a propeller-driven car designed by obscure occult artist-cum-engineer Jean-Julien Champagne. The younger de Lesseps had joined *l'Aéro-Club de France* in September 1909; he learned to fly on a

Blériot monoplane he had bought on November 23, 1909, at Issy-les-Moulineaux.

In 1911 the Champagne-designed vehicle, first designed as a sleigh on four Nivert skis, was rolled out of the workshop. With an approximate length of 4.5m (14ft 9in), it was powered by a 40 h.p. Labor-Aviation engine at the front, driving a Chauvière propeller. The whole vehicle, including seats for three people, was enclosed in a streamlined body of aluminium; its total weight, including fuel and a full crew, was 1,000kg (2,200lb).

Testing with the skis began at Pontarlier in eastern France in early 1911, during which a speed of 60km/h (37 m.p.h.) was obtained. But the thawing of the snow led to the tests being adjourned, at which point de Lesseps had the machine modified into a wheeled car — and, significantly, met Filippi. It is possible that engineer Emile Nivert, an enthusiastic advocate for propeller propulsion (suggesting the use of propellers for sleighs, cars and trains — but curiously, not aircraft) acted as the intermediary between de Lesseps and Filippi.

The de Lesseps vehicle was accordingly modified to carry a 100 h.p. engine delivering 1,000 r.p.m., and in June 1912 a 1.75m (5ft 9in)-diameter Cyrnos wing replaced the Chauvière propeller. Shortly afterwards the car was used



ABOVE Bertrand de Lesseps' wing-propelled car arrived in Lyon on August 12, 1912, fitted with a 1.75m (5ft 9in)-diameter Aile Rotative Cynros. The machine is seen here being embarked in a barge, although the Cynros wing mounted at the rear looks like it may be the smaller, 1.45m (4ft 9½in)-diameter version fitted subsequently.

for a much-publicised trial run from Paris to Lyon, during which a maximum speed of 82km/h (51 m.p.h.) was reached. In Lyon, the car was embarked in a barge and the Cynros wing was used to propel it along the Saône river. A further modification saw a Cynros wing of 1.45m (4ft 9in) diameter fitted to the car, which gave even better results, demonstrating a maximum speed of 92.5km/h (57 m.p.h.). The same year, Filippi announced that he had ordered the construction of a "*voiture laboratoire*" (laboratory car) in order to conduct experiments into the application of Cynros wings to ground vehicles.

GLORY — AND OBSCURITY

In August 1912 a lavishly illustrated brochure was published detailing the "*Propulseur Filippi*" and the Cynros rotating wing, despite Filippi having already sold all his ideas and patents to Roux's CINA. The brochure was signed by Rodolphe Orner, CINA's chief engineer, and M Moser as commercial manager.

At the 1912 Exposition Aéronautique held in Paris during October 26–November 4, CINA exhibited the de Lesseps sleigh as the "*Aéronive*" (or possibly "*Ailonive*"). As mentioned, the 1907 Malicet et Blin-built testbed, re-engined with a V8 engine and labelled Cynroptère, was also there and was exhibited alongside it. A large "*Aile Cynros*" logo was displayed prominently on the stand.

The French President at the time, Armand Fallières, was reported by the press to have been

impressed by the Cynroptère and intrigued by Roux's comment: "Here, M President, you are leaving aviation to enter aerial navigation — that is our whole programme". Roux introduced Filippi to the President and later to Grand Duke Alexander Mikhailovich, brother-in-law of Emperor Nicholas II of Russia and commander of the Russian Air Force, who made a notable stop at the stand where the Filippi machines were displayed. Many luminaries of aviation visited the stand: windtunnel pioneer Gustave Eiffel; Henri Farman; *Commandant* Charles Renard (renowned for his connection to *La France*, the first true dirigible airship); *Capitaine* Albert Étévé (autopilot and airspeed indicator pioneer) and Robert Esnault-Pelterie (who invented the "control stick") among others. Some even went to Clamart and Villacoublay to see the "*Ailomobile*" — the new name given to the de Lesseps vehicle refitted with wheels — in action.

On February 23, 1913, Charles Roux installed a Cynros wing on a hydroplane. Fitted with a four-cylinder engine, it was successfully tested on the Marne River between Nogent and Joinville in north-eastern France. As reported in the newspaper *l'Echo d'Alger*, the 7m (23ft)-long "dapper little boat" was duly christened by the local curate before setting sail, Charles Roux having named it the *Colonial*. Probably the same month, the de Lesseps sleigh, still fitted with a Cynros wing, won a competition in St Petersburg organised by the Russian war ministry for propeller-driven sleighs. According



ABOVE Rear view of the de Lesseps machine in sleigh configuration, and with a “système Filippi” propulsion unit, i.e. a Cynros wing, in the courtyard of the de Lesseps residence on the Avenue Montaigne in Paris. **BELOW** One of Filippi’s last-known designs was this 1926 American patent for a flying-machine with stabilising fan-like surfaces.

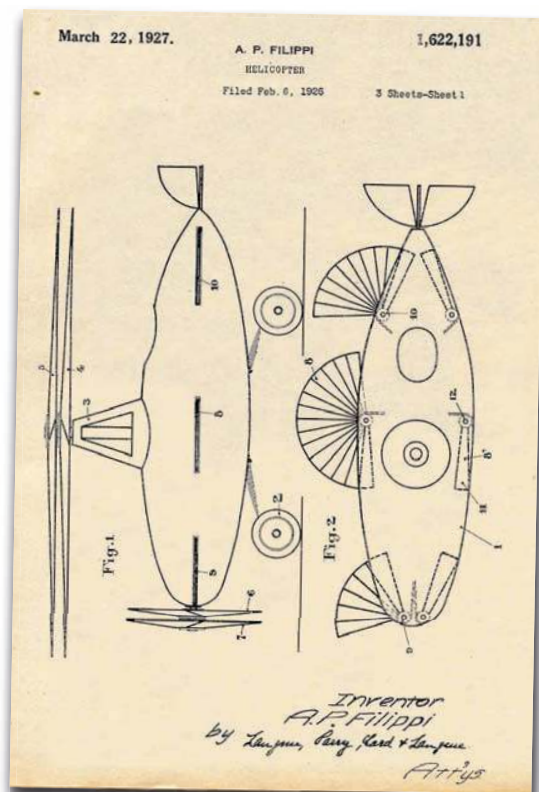
to at least one report, this sleigh vehicle was tested at Chamonix in the French Alps during January 1914 (although the date seems dubious), “fitted with a helicopter propeller”, probably the 1.45m-diameter Cynros wing used on the vehicle when in car configuration.

LA FIN

By December 1913 Charles Roux had sold his hydroplane design, by that time designated the “Bateau colonial système Roux”, but probably incorporating the Cynros wing, to the *Compagnie d’Aviation Borel*.

Bertrand de Lesseps came up with a few patents detailing his sleigh, always fitted with Cynros wings and with text referring to the “Filippi system”, but nothing else connected with aviation. In August 1918 de Lesseps, then *Capitaine* of the 20ème Régiment de Chasseurs, was killed in action in Picardy, thus ending any further development of the concept.

And that is where Filippi’s aviation adventure largely ends. After the First World War he patented a curious flying-machine with movable fan-like surfaces that could extend automatically from the fuselage for stabilisation — but after this he disappears completely from aviation history. Indeed, in *Capitaine Maurice Lamé’s* definitive 1926 tome, *Le vol vertical et la sustentation indépendante: hélicoptères, gyroptères, avions-hélicoptères*, on the theory and history of helicopters, there is not a single word about Filippi. Sic transit gloria mundi.



ACKNOWLEDGMENTS The author would like to thank Jean-Yves Artero for his invaluable assistance obtaining the photographs of the de Lesseps machine seen here



OK-JET! The **Tupolev Tu-104A** in **Czechoslovakia**

In November 1957 Czechoslovakian state airline ČSA entered the jet age when it took delivery of the first of six Soviet-designed and -built Tupolev Tu-104A jetliners operated by the airline during 1957–73. **MIROSLAV JINDRA**, whose father served on the type as a navigator, provides a profile of the “Brontosaurus”, as it was nicknamed, in ČSA service





DESPITE THE HEAVY rain on Friday, June 15, 1956, a Tupolev Tu-104 of the Soviet Union's state airline Aeroflot landed safely on Runway 22 at Ruzyně Airport (now Václav Havel Airport) in Prague, Czechoslovakia (now the Czech Republic), with no need for the braking parachute. The aircraft, registered CCCP-L5413, had been produced in the manufacturer's Kharkiv factory and had made its maiden flight on December 30, 1955. The sleek new jetliner looked majestic and powerful, and quickly garnered the nickname "Brontosaurus" in Czechoslovakia.

The Tu-104, Nato reporting name *Camel*, was essentially a civil derivative of the same company's Tu-16 *Badger* bomber, the airliner prototype making its maiden flight on June 17, 1955. Although Britain's de Havilland D.H.106 Comet had gained the crown as the world's first jet-powered aircraft to enter commercial service, it was grounded at the time of the Tu-104's visit to Prague in the wake of a series of fatal accidents. Thus during 1956–58 the Tu-104 was the world's only commercial jet transport aircraft in service.

Jetliner as political tool

The Tu-104's demonstration in Prague was not just a promotional exercise, however; there was also a clear political agenda. In the early days of Nikita Khrushchev's premiership of the Soviet Union, Aeroflot sought to expand its network into the West and beyond into more remote regions, this policy also extending to Czechoslovakia, which in 1955 was beginning to explore a thaw in its hitherto frozen international dealings.

For example, the 1955 International Air Transport Association (IATA) conference, held in

New York that October, was chaired by Pan Am President Juan Trippe and was the first time that *Československé státní aerolinie* (Czechoslovak State Airlines — ČSA) and Poland's *Polskie Linie Lotnicze LOT* had participated in the conference since 1948.

The Tu-104 represented a quantum leap in technology and would bring challenges to the airlines bringing it into service. The new turbojet-powered airliner flew at speeds in excess of 560 m.p.h. (900km/h) at 33,000ft (10,000m), requiring new techniques in numerous operational aspects, including weather forecasting, the storage and distribution of kerosene (at that time a new type of fuel), more precise radio navigation, the use of new airport equipment, the reinforcement and extension of existing airports and, last but not least, the development of onboard catering services, which also saw a significant leap in quality. The Soviets, however, assured the Czechoslovakian aviation authorities that the latter nation's technicians and pilots would have no trouble mastering these new and demanding techniques owing to their renowned skills. Nevertheless, the introduction of this one aircraft type would become a highly complex issue for Czechoslovakia's aviation industry.

In July 1956 the Czechoslovakian government signed a CZK100m (CZK — Czechoslovak *koruna*) contract with the Soviet manufacturer, the investment covering the import of three Tu-104As, configured for 70 passengers and fitted with more powerful Mikulin AM-3M turbojet engines. The contract also covered spares and technical equipment needed for the jetliners' operation, the provision of professional staff training, the installation of new runways and

OPPOSITE PAGE, TOP A ČSA promotional route map extolling the virtues of the airline's Tu-104A fleet; "minimum travel time, maximum comfort". OPPOSITE PAGE, BOTTOM ČSA's third "Brontosaurus", OK-LDC, at Nicosia, Cyprus, in 1971. ABOVE Dawn of a new era — Aeroflot Tu-104A CCCP-L5445. ALL IMAGES VIA AUTHOR UNLESS OTHERWISE STATED



ABOVE The Tu-104A's cabin accommodated 70 passengers, 16 in a four-abreast first-class configuration (two/aisle/two) in the forward section and 54 in a tourist-class layout of five abreast (three/aisle/two) in the aft section. In 1959, British magazine *Flight* sampled an Aeroflot Tu-104A, confirming the cabin's "much-publicised drabness".

approach lighting systems as well as the supply of high-capacity jet-fuel tankers. The purchase and import of new measuring and other equipment was also included within the terms of the contract, such as equipment from the UK for the transmission of meteorological maps, barometers from West Germany and special ceilometers from East Germany to measure the cloudbase. Ruzyně Airport was to be reconstructed with two urgent priorities; the extension of Runway 13/31 from 1,600m (5,250ft) to 2,600m (8,530ft) and the construction of new fuel storage tanks for 300,000lit (66,000 Imp gal) of kerosene. The cost per aircraft was 7m *roubles* (CZK17.5m), with the Mikulin engines costing CZK500,000 each.

East meets West

Aeroflot's Tu-104s were not fitted with radio navigation equipment compatible with Western European routes, but ČSA's Tu-104As incorporated American-built radio and navigation equipment. The sales embargo then in force on Warsaw Pact nations was sidestepped owing to ČSA's recently acquired membership of IATA and the International Civil Aviation Organisation (ICAO). For example, British-built Standard Telephones & Cable STS 18 C shortwave transmitters were purchased for CZK20,000 and the same company's STR 23 VHF communication station for CZK60,000. Other Western companies invited to tender were Collins, Marconi, Murphy, American Bendix and Lear.

As the Tu-104A's routes included long over-water sections, it was to be equipped with ICAO-standard lifejackets for the maximum number of passengers and crew, plus the corresponding

number of dinghies, each with survival equipment and emergency transmitter.

Special attention was also paid to the interior of the ČSA Tu-104As, renowned Czechoslovakian architect Karel Filsak being engaged to design the interior of the pressurised passenger cabin, and the latter's air conditioning system was modified to increase comfort. The 70 seats were divided into 16 first class in four abreast seating in the forward section and 54 economy in five abreast seating in the rear.

The Tu-104A differed from its Tu-16 bomber forebear in having a wider fuselage; the bomber's mid-wing arrangement was also reconfigured to a low-wing position in order to accommodate the pressurised passenger cabin. This reconfiguration led to the engine nacelles flanking the fuselage being redesigned, as well as modifications to the tail surfaces, undercarriage and detachable outer wing panels. Cabin noise levels remained very high, however, especially in the rear part of the cabin. Passengers "in the know" would try to book their seats in the forward cabin.

An issue that did not affect the Tu-104's Western counterparts to such a degree was the danger of explosive decompression. Like its bomber predecessor, the Tu-104 had a glazed navigator's position in the extreme nose and an extensively glazed flight deck. As a result, the Tupolev designers incorporated a pressure bulkhead with a door separating the cockpit from the passenger cabin. The latter was equipped with an automatic oxygen system, with facemasks provided in the chair pocket facing passengers in the case of decompression. Although such oxygen systems became mandatory in the West, Aeroflot deleted



ABOVE The Tu-104A's cockpit reflected the airliner's military origins, with a glazed nose to accommodate the navigator's station, reportedly easily adaptable into a bomb-aimer's position. The radio operator's station was behind the copilot, facing aft. The flight deck glazing incorporated heated double-layered windscreen panels.

its own in 1962 by order of Soviet aviation official Yevgeni Loginov, who deemed it to be unnecessary and a fire hazard. Interestingly, Soviet VIP jets remained so equipped!

The cream of the crop

A complete ČSA Tu-104 crew comprised eight members. Reflecting Soviet terminology, these were commander, second pilot, navigator, radio operator, flight deck mechanic, two cabin flight attendants and a chef. However, the latter was not a ČSA employee, but hired from the famous Hotel International in Prague. The catering was world-class and even included draught pilsner beer; tapping a keg in a pressurised atmosphere could be rather exciting!

Members of the Tu-104A aircrew were selected from an experienced group. A commander could be up to 38 years old, with previous experience as a commander of an Ilyushin Il-12 or Il-14 twin-piston-engined transport, or possibly a military Il-28 twin-engined jet bomber, as flown

by the Czechoslovakian Air Force, and with no disciplinary record or any other breach of security in the previous two years. Navigators and radio operators had to be completely proficient in Morse code, able to receive and transmit 120 characters per minute in open language. Flight attendants were required to be fluent in at least three languages; Russian of course, plus English and either French or Italian.

Dozens of ČSA air- and groundcrew were sent to Sverdlovsk (now Yekaterinburg) in the USSR in June 1957 for training, under the command of the highly experienced and respected airman Jan Lupták, veteran of the Second World War and the 1944 Slovak National Uprising. Groundschool and theory training took place in Moscow six days a week for two months. All students were highly motivated by the prospect of flying to the West, and after written examinations, at which all students excelled, a period of practical training began. One of the biggest challenges was establishing the co-operation required for the five

The first of ČSA's Tu-104As, OK-LDA Praha, taxis in at Heathrow on April 15, 1960, in the original colour scheme in which the type entered service. It featured a blue cheatline running the length of the fuselage, which terminated in a tapering lightning bolt and distinctive "beard" on the forward fuselage.

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ABOVE This 1958 ČSA timetable uses the futuristic planform of the state-of-the-art Tu-104 on its cover to promote the type's unique capabilities. With the British Comet grounded until the autumn of 1958, the Tu-104 was the only game in town in terms of jet airliners.

RIGHT First-class accommodation in a ČSA Tu-104A. Flight's rather haughty report on flying in the type in 1959 opined that the cabin was "ludicrously out of keeping with the lines and finish of the aircraft, [with] gold-anodised aluminium 'brass' racking with nets etc . . ."



BELOW Wearing ČSA's newly introduced colour scheme of white upper fuselage, aluminium lower surfaces and red titles, cheatlines and stylised bird motif, the airline's second Tu-104A, OK-LDB Bratislava, awaits its next service at Heathrow in August 1960. The type replaced Il-14s on the London—Prague service on April 1, 1960.

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ABOVE Fitted only with Fowler-type flaps and no other low-speed wing devices, the Tu-104A's landing speed was high, flight reporting that it "certainly seemed fast, though not hot, with quite hard braking causing expensive-sounding noises in the mid-ships galley". Here OK-LDC initiates the flare on landing at Heathrow on June 30, 1968.

crew members to perform their tasks at hitherto-undreamed-of airspeeds.

It was customary to operate a mixed Czechoslovakian/Russian crew aboard the Tu-104 during training. On one occasion a legendary Aeroflot instructor named Malyskin was involved in a serious incident during a training flight. A Soviet aircrew member misjudged the amount of fuel required for the flight. Malyskin, who was in the passenger cabin, took command of the aircraft on discovering this oversight and made the decision to land immediately at the nearest airport. During the approach to a military base, the fuel ran out and the Tupolev lost power to both of its engines. Malyskin sent everybody to the back of the aircraft and demonstrated great piloting skill, the silent "Brontosaurus" smashing its way through branches before making a hard landing on the threshold. Miraculously, there were no serious injuries and the aircraft was returned to flying training duties after repair.

The practical training element took two weeks, during which each pilot accrued around 15 flying hours, mainly flying circuits (four with the instructor, the fifth alone) and practising emergency procedures such as engine restarts in flight. Crews were also trained in *Oborudovanie slepoj posadky* (OSP — blind or instrument flying), involving an approach with two non-directional beacons (NDBs) or an instrument landing system (ILS), and missed-approach procedures. When poor weather at Sverdlovsk was forecast, the crew flew to Tashkent in Uzbekistan to continue training there. Navigators and commanders were able to accrue operational flight hours, thanks to experience on Aeroflot's domestic flights to and from Omsk, Irkutsk, Tashkent, Novosibirsk, Tbilisi and sometimes even Prague.

Meanwhile, the runway at Prague continued to pose a problem. The Tu-104A's take-off distance at maximum take-off weight (MTOW) was stated by the manufacturer at 1,960m (6,430ft). According to ICAO methodology, however, Ruzyně's most suitable runway, 22/04, had a functional length of only 1,880m (6,170ft), with fluctuations in temperature and air density also to be taken into account. The fact that ČSA's Tu-104s could not operate at maximum weight from their primary base would be a significant limiting factor until 1960.

Into the jet age

From October 26 to November 1, 1957, ČSA representatives took receipt of the airline's first Tu-104A, c/n 76600503. The freshly painted Tupolev, in its elegant blue, white and silver livery, had been produced at the manufacturer's Omsk factory and made its maiden flight that September. At 1500hr on Saturday November 1, 1957, Tu-104A OK-LDA (as it was registered), named *Praha*, landed at Ruzyně, marking ČSA's entry into the jet age.

Perhaps unsurprisingly, its first service, on December 9, was to Moscow. Two more Tu-104As were added to the fleet shortly afterwards, with OK-LDB *Bratislava* arriving on December 3 and OK-LDC *Brno* ten days later. Several test flights were completed before the type entered full scheduled service, in order to acquaint ČSA crews with local approach procedures and give local air traffic controllers the opportunity to familiarise themselves with the flight characteristics of the new jetliner. On services to many Western airports, ČSA Tu-104s were initially accompanied by military fighters for the entire flight, although the fighters did not land.



ABOVE Named *České Budejovice* in ČSA service, *OK-NDF* originally served with the Aeroflot fleet as *CCCP-42391*, before being the last Tu-104 delivered to the Czechoslovakian airline in February 1963. It is seen here at Paris-Orly in July 1965. Note the three roof windows to the port side of the cabin centreline, used to provide light in the galley.

Initial ČSA Tu-104A services included three main destinations, all from Prague; Moscow (four times a week), Cairo in Egypt and Beirut in Lebanon (with an occasional intermediate stop at Damascus in Syria before continuing on to Beirut), both of which were weekly. From Cairo the route was later extended to Bombay (now Mumbai) in India, with a stopover in Bahrain. In February 1958 Brontosaurus services started to Paris and Brussels, with London being added to the jetliner's route from April 1960.

During ČSA's first Tu-104A technical proving flight to Paris, on February 18, 1958, a pair of USAF North American F-100 Super Sabres intercepted and escorted it over West Germany, remaining alongside the airliner until its final approach to Orly. When French air traffic controllers requested information about the aircraft, ČSA's chief engineer Kvaček, aboard as part of the crew, refused to provide specific data. Despite this difficulty, the crew was able to complete several circuits and approaches at Orly before landing.

The Tu-104 was used as a symbol of Czechoslovakian technological progress during the Expo 58 "World's Fair" in Brussels during April–October 1958. The theme of the Czechoslovakian exhibition at the fair was "One day in Czechoslovakia", as part of which journalists were flown from Brussels to Prague in a Tu-104, where further exhibitions awaited them, under the strict supervision of the *Statní bezpečnost* (StB — state secret police) of course. In the evening a Tu-104 transferred the journalists back through the "Iron Curtain" to the "Free World".

As is often the case, the operation of an entirely new type of aircraft led to numerous accidents

and incidents in early service, crew members recalling that, in the early days, flying aboard the Tu-104 was "pure adrenaline". The new jetliner suffered a high rate of serious incidents caused largely by its aerodynamic peculiarities.

Flame-out!

The first of these took place on a Moscow—Prague service on May 16, 1958. The second Tu-104, OK-LDB, was near Warsaw at 12,000m (39,000ft) when it encountered heavy turbulence in a storm. The crew was unable to read the instruments, which were practically useless, and the aircraft quickly began to lose height. Both engines flamed out and the pilots and flight engineer fought to retain control of the airliner. As the aircraft descended through 4,000m (13,000ft) and the cloudbase, the turbulence abated and the crew managed to relight both engines. The dive was finally arrested at 2,400m (7,900ft).

Engine No 1 continued to suffer from alarming vibration, however, and was shut down again, the crew deciding to perform an emergency landing at Pardubice military air base, 100km (65 miles) east of Prague, with which both pilots, former military aircrew, were familiar. The subsequent investigation revealed that debris from an equipment failure in Engine No 1 had caused the problem. But it would get worse.

On October 17, 1958, Aeroflot Tu-104A CCCP-42362 crashed near Kanash in central Russia while en route from Peking to Moscow. The crew was unaware that the aircraft had entered a spin owing to an extremely aft centre of gravity combined with strong gusts, which had pitched the aircraft up into a stall. There were no flight data recorders aboard, but Capt Harold Kuznetsov continued



ABOVE “Care, Service, Attention = ČSA”, according to this Tu-104A promotional brochure distributed by the airline. An important aspect of the jetliner’s introduction into ČSA service was the qualitative leap in catering, provided by chefs from the Hotel International in Prague, and featured in three of the brochure’s five photographs!

to issue reports until impact. His heroic efforts were used extensively afterwards to investigate the accident. The subsequent investigation was undertaken under great political supervision as many of the 71 passengers killed were members of diplomatic delegations from 14 states, including a group of eight from Prague. Tragically, these became the first Czechoslovakian victims of the civil jet age.

As a result of the Kanash crash, in December 1958 the Soviet Council of Ministers issued a directive, in which the type’s maximum cruising ceiling was limited to 8,840m–9,750m (29,000ft–32,000ft), the maximum aft centre of gravity was moved from 30 per cent to 26.5 per cent, and the maximum tailplane incidence was reduced. The somewhat sluggish AGB artificial horizon, a holdover from the original bomber, was replaced with a new fighter-type AGI-1.

An extensive spinning test programme was also undertaken using two aircraft. During one test flight Tu-104 CCCP-L4521 stalled and flipped inverted, but Capt Kovalyov and his crew were able to make a safe landing. The aircraft had

stayed in one piece thanks to its impressive structural strength — another holdover from its bomber heritage.

A wing and a prayer

By far the most common incident experienced by Tu-104 crews, however, was running off the runway during landing. The Tu-104A had a high approach and touchdown speed for the time, about 260–290km/h (160–180 m.p.h.), largely because of its lack of low-speed wing devices. There were no slats, only two sections of double-slotted flaps, set to 20° for take-off and 35° for landing. Furthermore, the very noisy Mikulin RD-3M (AM-3) turbojet engines were not equipped with a reverse-thrust system, and the pneumatic brakes taken from the Tu-16 were inefficient, especially in “hot and high” regions.

It quickly became clear that there was only one reliable way to stop the aircraft on the runway: to deploy a braking parachute — or two. A pair of parachutes, each with a diameter of 5m (16ft), on one hinged cable, shortened the Tu-104A’s landing run by some 400m (1,300ft). In the case of

One of ČSA’s six Tu-104As trails its pair of braking parachutes on landing. Repacking and re-installing the parachute cartridge after each landing — on top of the risk of the parachutes tearing or snagging on ground-based equipment and obstacles — must have been something of a nuisance on scheduled services.

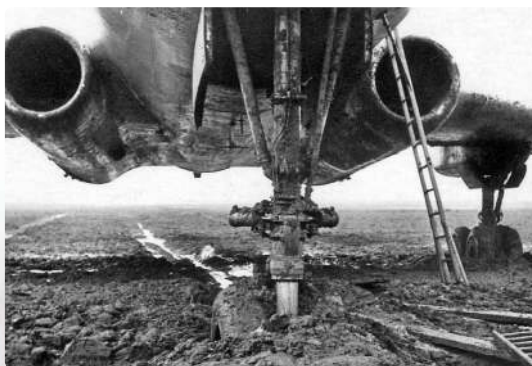




ABOVE LEFT A rare colour photograph of ČSA Tu-104A crew at work in the mid-1960s. In the seat is second pilot Flight Officer Josef Turecky, while Flight Engineer Jaroslav Pajer looks on. Note the Tu-104A's extensively glazed flight deck.



ABOVE RIGHT Navigator Vladimir Perka plots the route south from Greece, probably Cairo-bound, in the distinctive glazed nose of a ČSA Brontosaurus. Sadly, Perka was killed in the crash of Tu-104A OK-NDD at Tripoli, Libya, in June 1970.



RIGHT On March 21, 1963, both OK-LDB and OK-MDE overran the runway at Bratislava in one 60min period, closing the airport. One of the two is seen here buried axle-deep in mud. The twinwheel nose undercarriage unit was fully steerable and retracted rearwards.

BELOW On July 20, 1965, OK-LDC was landing on Runway 28R at Heathrow in heavy rain when the braking parachutes failed to deploy correctly and the aircraft ran off the end of the runway. The parachute package was found on the runway just beyond the aircraft's first point of touchdown. Although shaken, no passengers or crew were injured in the incident.



RIGHT An extract from the ČSA timetable for the winter schedule of 1967–68, using a stylish Tu-104A motif. DAVID H. STRINGER COLLECTION

BELOW Looking remarkably pristine for an aircraft of 15 years' service, OK-LDA is seen here at Zürich-Kloten in December 1972. The typically Soviet anhedral of the wings is noticeable here, as are the four-wheel bogies of the main undercarriage units.



a burst tyre, brake failure or a braking-parachute malfunction, however, the aircraft was almost unstoppable. With no reverse-thrust to call on, the crew had one final option; to shut down both engines and start praying.

At Bratislava on March 21, 1963, two ČSA Tu-104As overran both available runways within the space of one hour, closing the airport until both had been recovered. During June–July 1965 there were four runway incidents involving ČSA Tu-104As. One occurred at London's Heathrow Airport on July 20, when OK-LDC *Brno* overran the runway in heavy rain, breaking through two fences and coming to rest 850ft (260m) beyond the runway on an asphalt road. The braking parachute had been deployed, but was found in the touchdown area, still wrapped and packaged. The cause of the incident was found to be the incorrect handling of the parachute cartridge.

In other respects, too, it was an aircraft that was something of a handful. The author's father, ČSA Tu-104A navigator "Bob" Jindra, recalls an eventful trip in September 1964:

"After landing at Cairo we taxied to the terminal. Suddenly Capt Trojan said, 'look at that Arab guy on the starboard side, jumping and waving his hands'. I looked out of the window and saw flames flicking over the starboard wing to quite a height. It must have been visible from the tower, but there was no word from the atcos [air traffic controllers]. But a BOAC station mechanic sitting in a nearby car noticed it, grabbed a hand-held fire extinguisher and began to attack the flames on the starboard mainwheel leg. It took some

TUPOLEV Tu-104A DATA



Powerplant 2 x 8,700kg (19,200lb)-static thrust Mikulin AM-3M (RD-3M) turbojet engines

Dimensions

| | | |
|------------------------------|--------|--------------|
| Span | 35m | (114ft 10in) |
| Length | 37.05m | (121ft 5in) |
| Height | 12m | (39ft 4½in) |
| Wing area | 188m² | (2,024ft²) |
| Wing aspect ratio | 6.5:1 | |
| Wing sweep | | |
| Inboard of first wing fence | | 40° 30' |
| Outboard of first wing fence | | 37° 30' |

Weights

| | | |
|-----------------------|----------|-------------|
| Empty | 42,900kg | (94,580lb) |
| Normal take-off (TOW) | 78,000kg | (171,960lb) |
| Maximum payload | 12,000kg | (26,455lb) |

Performance

| | | |
|---|---------|---------------|
| Maximum speed | | |
| at 10,000m (33,000ft) | 950km/h | (590 m.p.h.) |
| Cruising speed | | |
| at 10,000m | 750km/h | (465 m.p.h.) |
| Landing speed | 240km/h | (150 m.p.h.) |
| Take-off run at maximum TOW | 2,350m | (7,700ft) |
| Landing run at normal landing weight* | 1,950m | (6,400ft) |
| Range with 8,000kg (17,640lb) payload | 3,200km | (1,990 miles) |
| Range with 12,000kg (26,455lb) payload + 5,650kg (12,455lb) fuel reserves | 2,300km | (1,430 miles) |

* without use of braking parachute



ABOVE On August 29, 1973, OK-MDE Ostrava was landing at Nicosia, Cyprus, on the penultimate leg of Flight OK531 routing through Baghdad—Damascus—Nicosia—Prague, when it ran off the runway and made a turn to the right at high speed, tearing off the port mainwheel before finally coming to rest. All 70 occupants escaped, although nine were injured.

RIGHT In 2007 the author's father, Bob Jindra, was reunited with Tu-104A OK-LDC, now an air restaurant at Petrovice. Bob accrued some 22,000hr as a navigator with ČSA on the Tu-104A and various other types including the scaled-down Tupolev Tu-124 and Ilyushin Il-62; but, as the author explains, the "Brontosaurus retained a special place in his heart".



time for the airport firefighters to arrive and foam us. Our flight engineer wanted to climb down the ladder to the ground, but we found that we had forgotten to load it in Prague. The cause of the fire turned out to be a ruptured hose from the hydraulics that oozed fluid over the hot brakes. The more we braked, the faster the fluid rolled out. All this was at an outdoor temperature of 50°C [122°F]. The mechanic from BOAC subsequently received a reward from ČSA."

It was not the end of the aircraft's problems, however, as Bob explains:

"It took two days for the machine to be ready to fly again. At Bahrain, the port fuel pump stopped working. Unfortunately, on the Tu-104 there was no fuel cross-feeding capability; the port engine took fuel only from the tank in the port wing. The starboard side was the same. We had enough fuel, but no way of using it. So we stayed in Bahrain for two days waiting for a mechanic with a new pump from ČSA's spares warehouse in Bombay.

"After two days we finally flew on to Bombay, where we handed over to the next crew. Zainub Villa, in the centre of the city, was used for the accommodation of ČSA crews. We had just opened a bottle of champagne out of sheer relief to be free

of the last leg when the second crew appeared! Apparently, after take-off, the pump had failed again, but on the starboard side this time. So they had returned to Bombay. I'll remember to my dying day that pump's designation — CN1D."

It had been enough for one trip. It was not over yet, however. Bob continues:

"After a few days we continued on via Rangoon [Burma] to Phnom Penh [Cambodia]. Because the taxiways there were extremely narrow, we had to taxi slowly and cautiously; but much to our annoyance we slid from the concrete taxiway on to the thick soil beside it. We tried to get back on to the concrete using our own engine power, but there was no chance. I remember it was a Saturday and there was a national feast or

celebration going on. It was not until Monday that three tanks arrived from the nearby military base to pull us back on to the concrete."

Bombay had always been an intended destination for ČSA's Tu-104s, but it quickly became clear that the jetliner was not well-suited to long-haul services. Its range at maximum commercial load was a comparatively short-legged 1,925 miles (3,100km) — Britain's Bristol Britannia turboprop had a range of some 4,000+ miles (6,400+km) — and the Tupolev's endurance was a mere 3hr 30min. Bombay, however, was an important staging post on the way to a political objective — Jakarta in Indonesia. In the 1960s, despite the type's poor range, ČSA operated a Prague—Cairo—Beirut—Bahrain—Bombay—Phnom Penh—Jakarta route with Tu-104As, covering some 13,944km (8,665 miles). At the Far East airports on the route it was not unusual to see ČSA Tu-104s run out of fuel on the taxiway after landing at the end of one of the longer sectors.

Deceptive attrition rate

During 1955–60 a total of 207 Tu-104s in several variants was built. At first glance, the type's attrition rate in ČSA service seems unusually high; three of the six operated by the airline were written off — 50 per cent of the fleet. In mitigation, however, the popularity of the type was very high with its crews and technicians throughout its 17 years of service.

The oldest of ČSA's Tu-104As, OK-LDA *Praha*, performed its last commercial flight on September 6, 1973, on a Kiev—Prague service. Three days later the aircraft was delivered to the Kbely Aviation Museum in Prague, having accrued 20,128hr 53min of flying time and 11,140 landings in the logbook. The last two remaining examples, OK-LDC *Brno* and OK-NDF *České Budejovice*, were retired the following year and still survive, one as an "air restaurant" and the other at a private air park in the Czech Republic.

BELOW Retired in September 1973, OK-LDA was donated to the Kbely Aviation Museum, Prague, where it spent more than 30 years deteriorating in open storage. It is seen here in 1995. Happily, the historic jetliner was restored to pristine condition in 2007, in the ČSA colours in which it spent most of its career. It remains on display at Kbely.

PETER DAVISON

ČSA'S Tu-104A FLEET



A TOTAL OF six Tu-104As operated with ČSA. Four new examples were delivered between November 1957 and March 1962; two more were transferred from Aeroflot during 1962–63. Two of the six were destroyed in accidents without casualties, and OK-NDD was lost in a fatal landing accident in 1970. The remaining three machines may still be seen in the Czech Republic.

OK-LDA *Praha*, c/n 76600503

Delivered new 2.11.57; retired 14.9.73; currently on display at the Kbely Aviation Museum, Prague

OK-LDB *Bratislava*, c/n 76600601

Delivered new 3.12.57; destroyed by fire during refuelling at Bombay, 16.3.63

OK-LDC *Brno*, c/n 76600602

Delivered new 30.12.57; retired 1974; currently an "air restaurant" in Petrovice

OK-NDD *Pízeň*, c/n 96601803

Delivered new 12.3.60; destroyed during third attempt to land at Tripoli, Libya, 1.6.70

OK-MDE *Ostrava*, c/n 86601202

First flight 31.10.58; delivered to Aeroflot as CCCP-42368 in 1.59; delivered to ČSA 12.3.62; damaged beyond repair at Nicosia, Cyprus, 29.8.73

OK-NDF *České Budejovice*, c/n 9350801

Delivered to Aeroflot 31.1.59 as CCCP-42391; to ČSA on 25.2.63; last flight 25.4.74, retired 9.74. Used as bar in Olomouc, Czech Republic. In 2012 moved to private air park at Zruč, near Pilsen

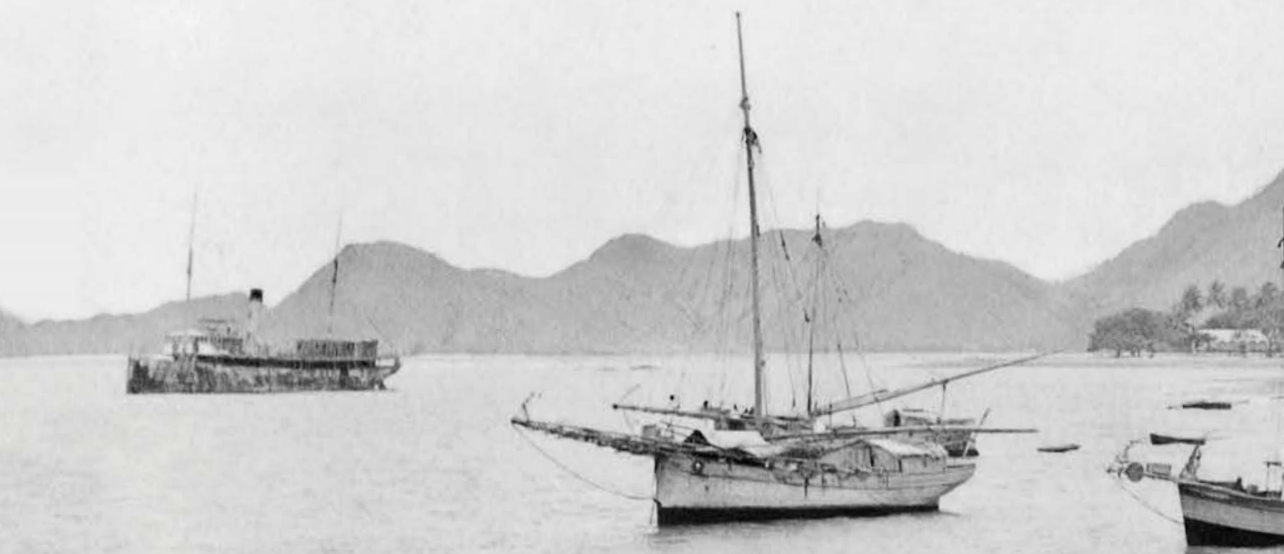
Despite being a pioneer in the field of jet-powered air transport, the Tu-104 had only one export customer, ČSA, which also went on to acquire the scaled-down Tu-124. Production of the Tu-104 ended relatively early, although Aeroflot kept its examples working on domestic services until the 1980s. The final flight of a Tu-104 was made in 1986, when CCCP-42322 was flown to an air museum in Uljanovsk.





from **Australia's Department of Civil Aviation** in Portuguese Timor, 1941-42: Part 1 flying to spying

In January 1941 the British and Australian governments diverted the Qantas Empire Airways flying-boat service through Portuguese Timor, a strategically important colony of increasing interest to the Japanese. **PHIL VABRE** reveals how Australia's Department of Civil Aviation, sent to establish radio communications, also had a rather more covert task



AT THE END of 1940, with France and The Netherlands occupied by German forces, and Britain fighting for its life, the attention of the European colonial powers was focused at home rather than on their colonies in Asia. Japan, meanwhile, was mired in a separate war with China that it could not end, and was also facing an increasingly antagonistic America. Confronting the likelihood of export restrictions imposed by the USA, and always short of critical materials such as oil, rubber, iron and other minerals, Japan was looking to secure alternative sources of supply in south-east Asia and the south-west Pacific.

As 1940 progressed, in Japan the necessity of expansion to the south through military conquest became generally accepted among the



QEA LOGO DAVID WILLIAMS

political elite, with the attendant likelihood of war with Britain and the USA. On the diplomatic front, Japan sought to enter an alliance with Germany and Italy, a move specifically directed against Britain and its interests in Asia.¹ In advance of possible military action, throughout the 1930s Japan had also sought to expand its trade and diplomatic influence in the south-west Pacific.

A strategic objective

One target for increased Japanese influence was the impoverished colony of Portuguese Timor. Colonised by Portugal in the 16th Century and comprising the eastern part of the island of Timor, it was located in the Timor Sea at the south-eastern extremity of what was then the Netherlands East Indies (NEI) and about

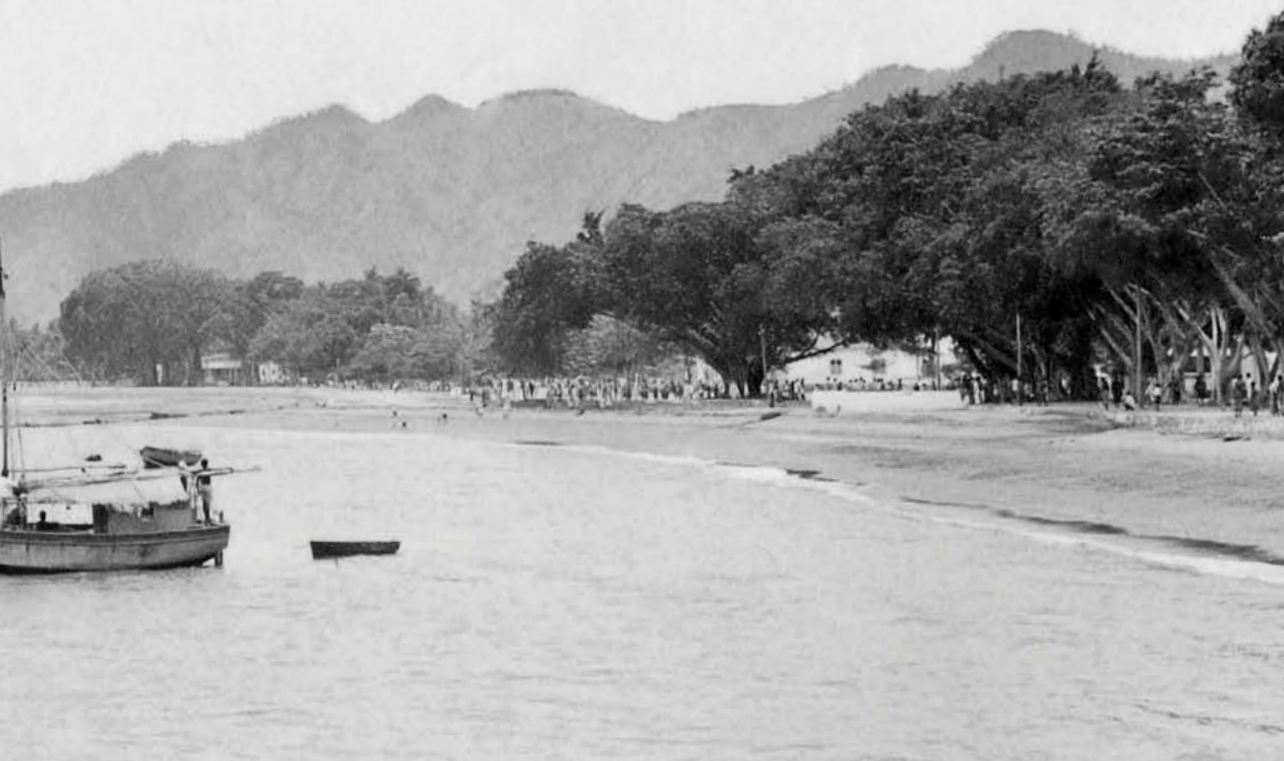


OPPOSITE PAGE, TOP *Underlining the principally political nature of the Qantas Empire Airways (QEA) Dili service, this letter, dated January 21, 1941, was one of only 21 items of mail flown from Dili on QEA's NE51 service to Sydney, operated by Short empire Flying Boat G-ADUV Cambria.*

AUTHOR'S COLLECTION

MAIN PICTURE *Taken by DCA Radio Inspector Ivan Hodder, this photograph shows Cambria arriving at Dili on January 21, 1941, on the inaugural scheduled eastbound service, NE51.*

CAHS / IVAN HODDER COLLECTION





ABOVE LEFT Former Great War fighter pilot Capt Edgar Johnston DFC joined the Civil Aviation Branch in 1921.
ABOVE CENTRE H.V.C. Thorby, Australia's Minister of Defence during 1937–38 and Minister of Aviation 1938–39.
ABOVE RIGHT Arthur McComb was instrumental in establishing supporting bases for the QEA flying-boat service.

400 nautical miles (750km) to the north-west of Darwin in Australia's Northern Territory. Neglected by Portugal, the local authorities saw in Japan a market for coffee, one of the main export crops, and a source of investment in the colony.² Nevertheless, they remained somewhat ambivalent towards Japan.³

The strategic location of Timor was not lost on the British or Australian governments. In 1932 reports circulated that Japan was negotiating to purchase the Portuguese half of Timor.⁴ This may have been what prompted the government of the colony to write to Imperial Airways in Britain, proposing the use of the capital, Dili, on an air service linking Australia and Britain. The letter pointed out that Portuguese Timor was the only territory between Australia and Singapore not controlled by the competing Dutch.⁵ Although nothing came of the negotiations with Japan, or the proposed air service, two years later, shortly before the opening of the Australia—England air service, there were reports that Britain was considering buying the whole island of Timor from the Dutch and Portuguese. The intention was reported to be to build a "giant air port" and wireless station.⁶

Nor had the growing Japanese influence in Portuguese Timor gone unnoticed by the British and Australians, who were concerned about the strategic and economic consequences of a Japanese foothold on the doorstep of Australia. In August 1937 the Governor of Portuguese Timor, Major Álvaro Eugénio Neves da Fontoura, passing through Batavia on Java (now Jakarta, Indonesia), called on the British Consul-General, Mr H. Fitzmaurice, and expressed a desire that air communication with Portuguese Timor should be established, preferably by a British airline.⁷ (In this category, he undoubtedly included Australia.) At that time, the Qantas Empire Airways (QEA) de

Havilland D.H.86 service to Singapore passed through the capital of the Dutch western half of Timor, Koepang (now Kupang). [See David Crotty's *The Singapore Express*, TAH13 — Ed.]

Fitzmaurice was alive to the potential consequences of developments in Portuguese Timor. In addition to keeping both the British and Australian governments informed, when Wilmot Hudson Fysh, General Manager of QEA, passed through Batavia a week later en route to England for talks with Imperial Airways, Fitzmaurice briefed him on both the situation in Portuguese Timor and the Governor's request. In his report to Britain, which was copied to Australia, Fitzmaurice noted:

"I have, as you are aware, lately advocated that the Government of Australia should, largely for strategic reasons, develop a closer contact with Portuguese Timor. An air connection such as Major da Fontoura desires would certainly serve to strengthen such a contact, and consequently appears *prima facie* likely to be in the interests of the Commonwealth Government, even if it may not offer any great prospect of immediate profits to Qantas."⁸

Subsidised as it was under the Empire Air Services Act, QEA required Australian government approval to vary the route to Singapore.

Bureaucratic pass-the-parcel

In February 1938 the Australian Controller-General of Civil Aviation, Edgar Johnston, officially proposed the establishment of an Australian air service from Darwin to Dili.⁹ The proposal was referred to the Defence Committee, which took an equivocal position. The Committee noted that "any action which would further the development of British and Australian influence in Portuguese Timor should be encouraged" but at the same time did not want to spend



ABOVE *Lacking a state-of-the-art transport aircraft of its own, in the late 1930s Australia's Civil Aviation Branch chartered Guinea Airways' Lockheed 10A Electra VH-AAU Salamaua for several tasks, including the flight-testing of Lorenz radio navigation beacons and the July 1939 survey flight to Dili. It is seen here at Adelaide-Parafield.*

any defence money on establishing the service, preferring to spend what money was available on shoring up Australia's weak home defences.¹⁰

In a game of bureaucratic pass-the-parcel, the proposal was then referred to the Inter-Departmental Committee on Air Transport Services, which considered that the proposal was outside of its scope of responsibility, but suggested it be referred in turn to the Department of External Affairs for its view. The latter, worried that "Japan's real interest in Portuguese Timor is but the move of a pawn in a big game of southward expansion, to be followed by moves of more aggressive pieces when the time seems propitious, Australia being the real objective", strongly supported the proposal.¹¹

With the strong backing of External Affairs, in March 1939 the Australian Minister for Civil Aviation, H.V.C. Thorby, made a submission to Cabinet "that an air service be established from Darwin to Dili in Portuguese Timor".¹² Thorby summarised developments to that point and noted that an air service would not only help to stem the growth of Japanese interests in the colony, but would also assist in Australia's desire to obtain concessions for oil exploration. Thorby also noted that Dutch airline KNILM had made approaches to open an air service to Dili, but had so far been rebuffed by the Portuguese.

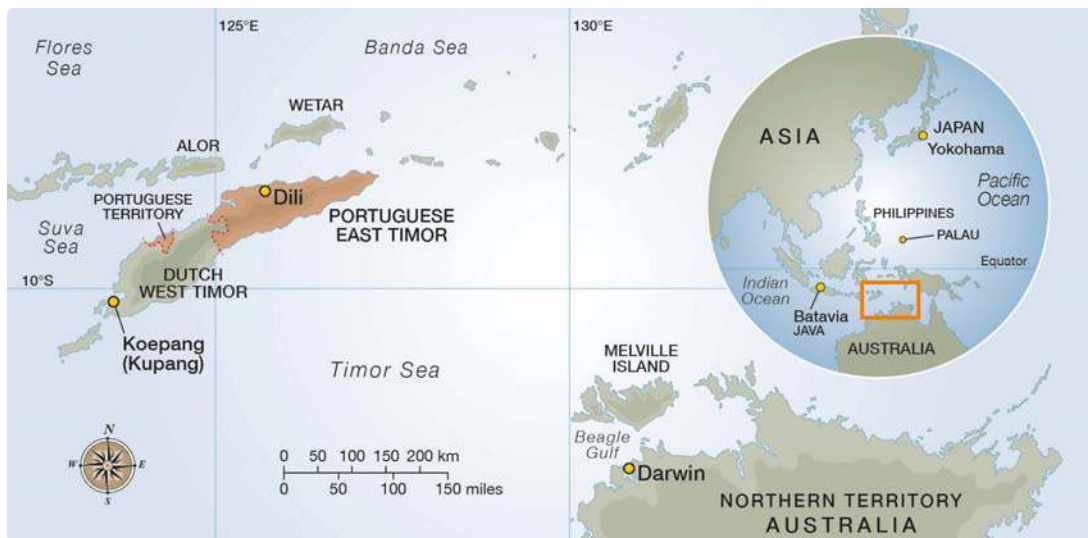
A flying visit to Dili

Arising from Thorby's submission, a month later the Commonwealth Government, at the request of Johnston, cabled the British Ambassador in Lisbon, requesting him to approach the Portuguese government with a proposal to operate a weekly landplane service from Darwin to Dili. The cable also noted that Australia wished to "send a responsible officer of the Australian Civil Aviation Department to Timor at an

early date to consult with Portuguese authorities".¹³

Some three months later the new Minister for Civil Aviation, J.V. "Jim" Fairbairn, made a literally flying visit to Dili to conduct negotiations for an air service. Also in the party were the Department of Civil Aviation's Superintendent of Flying Operations, David Ross, and Controller of Ground Operations, Arthur McComb. Fairbairn and McComb were in the process of making a tour of inspection of aerodromes and facilities throughout eastern and central Australia, and arrived in Darwin on the flying-boat service. There they met Ross and a party from Guinea Airways in the latter's Lockheed 10A Electra VH-AAU *Salamaua*, which had flown up from Adelaide.¹⁴ Apart from securing the local Portuguese authorities' agreement to the establishment of an air service, the party aimed to determine whether such a service would be best operated by a diversion of the existing QEA flying-boat service through Dili, or by an extension of Guinea Airways' Adelaide—Darwin landplane service.

On Saturday, July 22, 1939, *Salamaua* departed Darwin before dawn for Dili, reportedly becoming only the third aircraft to land at Dili aerodrome.¹⁵ On arrival the party was treated to a banquet and a parade by the colony's native army marching bravely in bare feet. Language initially proved a problem, with the Acting Governor speaking English, but unable to understand Fairbairn's, and Fairbairn speaking French but unable to understand the Governor's! Eventually, with the Governor speaking English and the Minister French, successful communications were established. The Acting Governor and other officials were taken for a flight in the Lockheed before the Australian party returned to Darwin, arriving an hour before sunset on what was the first ever same-day international return flight from Australia.¹⁶



MAP BY MAGGIE NELSON

Negotiations for the commencement of an air service to Dili were successfully concluded, although final ratification would have to await approval from Portugal.¹⁷ The Australians initially had in mind a possible extension from Darwin of Guinea Airways' domestic services, but they inspected the Dili aerodrome and concluded that it was not suitable for regular operations.¹⁸ On the other hand, the harbour seemed suitable for flying-boats and attention thus shifted toward a diversion of the QEA service.

Apart from the question of whether the service should be by landplane or flying-boat, the other main problem to grapple with was the lack of suitable wireless support for a regular service. It was doubtful that the colony, poor and lacking technical expertise, could provide this support, so the Australian government was faced with the need to provide a wireless service itself. This was another matter to weigh in the balance between the cost of establishing a service to Dili and the strategic value of using the air service to contain Japanese influence in Timor.¹⁹

The Japanese, meanwhile, also saw the political

benefits of establishing an air service linking Timor with Japan. Their instrument to achieve this was an extension of the existing flying-boat service to the Japanese Pacific island of Palau, in the western Carolines. This service was operated by *Dai Nippon Kōkū Kabushiki Kaisha* (Imperial Japanese Airways), half-owned by the Japanese government. After protracted negotiations²⁰ the Portuguese government agreed to Japan operating six survey flights to Dili.²¹ The flights were to occur during October 1940–June 1941.²²

Since the existing radio facilities in Dili were very limited, the Japanese flights were supported by a tender, the *Neishi Maru*, a vessel of about 150 tons equipped with wireless and capable of providing meteorological reports and navigation assistance to the aircraft. Within 48hr of the Governor of Portuguese Timor receiving advice of the approval of the survey flights, the *Neishi Maru* arrived in Dili harbour from Palau, although it was not expected until about a week later. The *Neishi Maru* also brought with it stocks of aviation gasoline to refuel the Japanese flying-boat.

The first Japanese survey flight departed Palau

BELOW Another of the photographs taken by Radio Inspector Ivan Hodder in Portuguese Timor in early 1941, this shows the Japanese tender *Neishi Maru* (referred to in some sources as the *Nanyei Maru*) in Dili harbour. The *Neishi Maru* was used as a wireless ship during the experimental flying-boat flights undertaken by the Japanese.

CAHS / IVAN HODDER COLLECTION



Short S.23 Empire Flying Boat G-ADUW *Castor* made a diversion on westbound Horseshoe Route service WS47 on December 29, 1940, to bring a party of Australian Department of Civil Aviation (DCA) officials to Dili. As well as negotiating an air service to Portuguese Timor, the party also had a secondary intelligence role, to gather information about the colony and the Japanese presence there.

SHORTS VIA AUTHOR



on October 22, 1940, and had to adopt a circuitous route on the 5hr flight, skirting Hollandia (now Irian Jaya), and Halmahera and Ceram Islands, to avoid Dutch territory.²³ At Dili the aircraft alighted outside the reef and taxied into the harbour, where moorings had been specially laid. The aircraft used was a demilitarised Kawanishi H6K2-L Navy Transport Flying Boat Type 97; later given the wartime Allied codename *Mavis*.²⁴ Designed for the Japanese Navy as a long-range reconnaissance flying-boat, 20 were converted into civil transports and delivered to the *Kaiyo* (Ocean) Division of Dai Nippon Kōkū for service on the Yokohama—Saipan—Palau—Timor and Saipan—Truk—Ponape—Jaluit routes. In civilian fit the Type 97s could carry up to 18 passengers. Modifications included the deletion of armament and reconfiguration of the hull interior.²⁵

Australia reacts

Two months after the first of the Japanese proving flights, QEA operated two proving flights of its own to Dili. The first was a diversion of Horseshoe Route service WS47 (“West then South”). It was operated by Short S.23 Empire Flying Boat G-ADUW, named *Castor*, under Capt H.B. “Bert” Hussey, and alighted on Sunday, December 29, 1940, as a side-trip on the normal westbound service.²⁶ The flying-boat was carrying a party from the Department of Civil Aviation (DCA) comprising Edgar Johnston, David Ross and Dr K.N.E. “Bill” Bradfield (**ABOVE RIGHT**), a civil engineer and aerodromes expert. Their ostensible purpose was to investigate the provision of facilities for the proposed Dili air service. The outcome would determine conclusively whether the Australian service should be operated by land- or seaplanes.

Another important purpose of the visit, not disclosed to their Portuguese hosts, was to secure intelligence information about the territory, in



CAMS / BILL BRADFIELD COLLECTION

particular what the Japanese were up to. The Australian Department of Air (military aviation department) was disturbed by reports of Japanese activities and was “most anxious the authenticity of these reports should be investigated”.²⁷ Bradfield later recalled:

“Towards the end of 1940 it was learned that Japan had been making some survey flights to Dili in Portuguese Timor through Palau in the Marianas [sic]. The interested Australian authorities wanted to know more about what was going on. The trouble was that we did not know whether Portuguese Timor was friend or foe. Historically and traditionally it should be friendly. But we had had the experience, earlier in the year, of New Caledonia turning away from



ABOVE *The facilities at Dili were found to be somewhat primitive by the DCA party, as evidenced by this picture, taken by Bill Bradfield, of a workshop being erected at the aerodrome there. Bradfield studied engineering as a Rhodes Scholar at Oxford University and learned to fly in the UK, returning to Australia in 1939 to join DCA.*

France to support the German-dominated Vichy Government. Things were rather confused in those days and we really did not know what to expect. Messages to Lisbon had been unanswered.

"It was decided to send me to Dili to find out, on the pretext that I was making a survey of facilities available for a possible Qantas flying-boat service on [its] route to Singapore. The idea was that I would be dropped off on a diversion flight to Dili, on the Darwin—Koepang sector of the Qantas Sydney—Singapore flying-boat service, and be picked up again on the return trip several days later. I was rather euphemistically advised to put my affairs in order in case that did not happen.

"Then wiser counsel prevailed when someone pointed out that if one man went alone and the atmosphere was unfriendly, it would be all too easy for him to meet up with some little accident and nothing would be achieved. Thus it was decided to send a larger party, not only to make a survey of the facilities, but to get agreement from the Portuguese Timor authorities for an air service to commence between Darwin and Timor.

"We still did not know whether we were meeting friend or foe, so Capt Hussey kept the engines running, threw out a sea anchor and got the aircraft in position for a quick take-off out to sea if this became necessary. I remember that my job then was to stand by the rope of the sea anchor with an axe and cut it if we had to make a quick getaway.

"A man dressed in singlet and shorts who was

fishing nearby in a small open boat came over, found who we were and dashed off to the shore while we waited for the next move. This came about half an hour later when the harbourmaster arrived in a launch, very obviously friendly, and took us ashore. Then we found that our fisherman acquaintance had made a commendably quick change and was in resplendent uniform with epaulettes and gold braid, and with a guard of honour in full Portuguese Colonial uniform, all in the space of less than an hour on a Sunday morning. The fisherman turned out to be the aide-de-camp to the Governor, and Capt Johnston took the salute and inspected the guard with his customary quiet dignity.

"Our reception in Dili could not have been warmer. The difficulty had been that the Governor had received some rather garbled message and was not expecting us for another week."²⁸

Gathering intelligence

The Australians quickly established that Dili aerodrome was not satisfactory, as it stood, for the year-round operation of the suitable landplane types that were available, either Guinea Airways' Lockheed 10s or 14s, or QEA's D.H.86s. The aerodrome could be made suitable, but only with considerable expenditure of time and money. On the other hand, the harbour offered a sheltered anchorage with a take-off and alighting run into the prevailing wet-season winds to suit the Empire 'boats. At other times of the year take-off



ABOVE During its December 1940 visit to Dili, the DCA working party was shown this splendid metal model of a Kawanishi H6K2-L, the type that completed the Japanese proving flights to Dili during late 1940 and early 1941. The model, photographed by the DCA party, had been presented as a gift to the Governor of Portuguese Timor.

and alighting on the open ocean outside the reef was possible. The only expense necessary was the installation of a new mooring buoy suitable for the Empire 'boats, of which a spare was available at Darwin.

The existing wireless facilities were found to be antiquated and based on a radio station erected by the Royal Australian Navy during the war of 1914–18. Although communications with the flying-boat could be maintained virtually until alighting at Darwin, critically the equipment could not operate on 333kHz, a frequency compatible with the Empire flying-boat's on-board direction-finder.

The Australians were also keen to find out what they could about the Japanese proving-flights and were shown a metal model of the Japanese flying-boat that had been presented to the Governor. From the obvious provision for a tail turret, and also nose and midships hatches for gun mounts, it was clear that the aircraft was a design of military origin. They were able to photograph the model and, from an inscription on it, they were able to correctly identify the manufacturer as Kawanishi. Back home, neither the Departments of Civil Aviation nor Air were able to match the aircraft with any known type. It seems likely that the photographs of the model Type 97 flying-boat that the DCA party brought back contained the first information obtained in the British Empire about this aircraft type. Press reports subsequently surfaced claiming the

aircraft to have been based on a Sikorsky design, to which there was a certain resemblance.²⁹ The aircraft was, in fact, a wholly indigenous design although, ironically, it had benefited from a visit by Kawanishi personnel to Short Brothers before the war.³⁰ This was an indication of the widespread underestimation of the advanced state of the Japanese aircraft industry that would haunt the western powers in the very near future.

Secret transmitter?

Rumours had circulated that there were large numbers of Japanese active in Dili, and that a transmitter was being operated by them. The Australians were able to ascertain that there were in fact only 13 Japanese currently living in Dili: nine men, two women and two infants. Furthermore, there was no evidence of a Japanese transmitter apart from the one on board the *Neishi Maru* in support of the flying-boat operation, a revelation that must have eased Australian military concerns somewhat.

Finally, the Australians made as thorough an examination of conditions in Portuguese Timor as was possible during their short visit, reporting such things as the colony's import and export requirements, the extent and condition of the road system, the state of the buildings in Dili, key personnel in the government and their attitudes to the British, Dutch and Japanese, English-speakers in the colony and fuel stocks. Johnston's report concluded, rather chillingly, with a list of



ABOVE Qantas made another diversion to Dili, on the Sydney-bound service NE45 on New Year's Day 1941, to retrieve the DCA party, this time using S.23 G-AEUE *Cameronian*, seen here picking up the buoy after alighting at Groote Eylandt in late 1938. This Empire Flying Boat survived the war and was scrapped at Hythe in the UK in 1947.

vulnerable points that could be attacked in case of war. Bill Bradfield recalled:

"Our last night in Dili was New Year's Eve, 1940. We were invited to a party given by the Governor. Edgar Johnston had had the diplomatic foresight to bring some Scotch Whisky with him, and the two bottles he brought to the party were double the total amount in Dili at that time. It was a memorable evening and a fitting end to a mission in which I first came to experience the leadership qualities of Edgar Johnston."³¹

Three days after dropping off the DCA party, Qantas made another diversion to Dili, on New Year's Day 1941, to retrieve them. The service was the Sydney-bound NE45 ("North then East"), operated by Empire flying-boat G-AEUE *Cameronian*.³² After refuelling from drums brought in on the flying-boat, *Cameronian*, under Capt Orm Denny, departed soon after noon and took up an easterly course along the northern coastline of Timor. The party aboard the aircraft was able to get a good appreciation of the geography of eastern Timor, particularly looking for potential emergency landing grounds for landplanes or sheltered anchorages for flying-boats. About 20 miles (32km) from the eastern tip of the island the aircraft altered course to cross the island to the south, and thence to Darwin.

Regular services

Back in Australia, and with the operational question clearly resolved in favour of flying-boats, Johnston lost no time in despatching DCA Radio Inspector Ivan Hodder to Dili to modernise the radio facilities. In early January 1941 Hodder was personally briefed by letter from the Acting Minister for Air, John "Black Jack" McEwen, to get to work on the installation at Dili.³³ Also, in order to make final arrangements for the regular

service, Hudson Fysh made his way via the regular Empire 'boat service to Koepang. There, Fysh boarded a Fokker of *Serviços Aéreos da Colonia Portuguesa Timor* for Dili.³⁴

On Wednesday, January 15, 1941, McEwen announced that as of later that week Dili would be included on the regular QEA flying-boat service.³⁵ Fortnightly stops were made at Dili, alternating weekly in each direction, as a diversion from the normal route between Darwin and Koepang.³⁶ Mail rates to Dili were 9d for the first ½oz and 8d for each subsequent ½oz, with postcards being charged at 5d.³⁷

The first scheduled call was made by westbound service WS53 leaving Sydney on January 17 and arriving in Dili two days later. It was operated by Empire flying-boat G-AETV *Coriolanus*, once again under the command of Capt Hussey. Arriving on this inaugural westbound service were C.W. "Bill" Neilson, a Qantas Traffic Officer due to open the Qantas office in Dili, and Radio Inspector Ivan Hodder. The latter had been responsible for the official acceptance of many of the original Aeradio stations in Australia.

Hodder recalled in 1985:

"I was back in Darwin in January 1941 on my way to Portuguese Timor to install a typical AS9 transmitter and battery-operated receiver at Dili. The only other radio facility in Dili had been ship-to-shore, and Qantas operations refused to go in there unless Aeradio communications and a 333kHz homing beacon were provided. Canberra agreed to this, and DCA provided the equipment — all free!

"I left Sydney by flying-boat on January 17 after picking up some necessary equipment from AWA³⁸ and overnights at Townsville [Queensland], where some antenna items came aboard. Arrived Darwin next afternoon via



ABOVE LEFT John "Black Jack" McEwen, who went on to become Australia's Prime Minister (briefly) in December 1967. **ABOVE CENTRE** Radio Inspector Ivan Hodder played an important part in establishing the early network of Aeradio stations throughout Australia and New Guinea. **ABOVE RIGHT** Qantas Traffic Officer C.W. "Bill" Neilson.

Karumba and Groote [Eylandt] and completed the equipment pickup, which included the original AS9 transmitter I had installed in Darwin and which had been 'mothballed'. Departed next morning for Dili via Koepang (Skipper Steve Howard) and reached there at 11am local time."³⁹

Having completed his own arrangements in Dili, Hudson Fysh handed over to Neilson and returned to Australia on the first scheduled eastbound service, NE51, operated by interchange 'boat G-ADUV, *Cambria*, under the command of Qantas Capt Russell Tapp, arriving in Sydney on January 23.⁴⁰ Three weeks later D.D. "Doug" Laurie from Qantas arrived in Dili to take over from Bill Neilson as Station Superintendent.

Setting up

Meanwhile, Hodder set to work in Dili. With the assistance of local operator Patricio José da Luz (known as Pat Luz), and another junior operator, he installed the new radio equipment in the Post Office, where the colony's existing unreliable radio equipment was housed. Darwin Aeradio

was of great assistance in responding to test calls while the new equipment was being set up, and eventually reliable communications by day and night were established on 6,590kHz with several Dutch stations to the west, with Darwin and even with Karumba, some 1,000 miles (1,600km) to the south-east. Aircraft could be worked in daylight up to 200 miles (320km) away on 333kHz, with the Empire 'boats being able to use direction-finding (DF) on the station from about 20 miles (30km) out, which was considered satisfactory by the Qantas captains.

For the remainder of 1941 the Dili service operated on alternate fortnights. A minor change to the timetable was required in order to avoid arriving in Darwin after dark. This was necessary because of the slightly longer distance via Dili and also the longer time taken to refuel owing to the lack of a purpose-built refuelling launch. Shorter daylight hours in winter and the onset of prevailing south-easterly monsoon winds were also factors. This meant that eastbound departures had to leave Sourabaya on Java at

Kawanishi H6K2-L, with Japanese civil registration J-BFOY and named Sazanami, in Dili harbour during the third Japanese proving flight to Portuguese Timor in January 1941. The type was virtually unknown beyond Asia at the time, and it is likely that Ivan Hodder's photographs of what would soon become an important enemy aircraft revealed the first evidence of its existence to the intelligence services of the British Empire.

CAHS / IVAN HODDER COLLECTION





ABOVE *The Australians established good social relations with the Portuguese in Dili. Bill Neilson is seen here (far left) enjoying a drink with locals at a finca in the northern coastal town of Liquiçá. The Portuguese then also controlled the Oecusse exclave in Dutch West Timor, but the Japanese invaded the whole island in February 1942.*

0500hr instead of 0530hr, necessitating the laying of a flarepath for take-off.

Even after nearly two-and-a-half years of Empire flying-boat operations, night-flying facilities were still not fully in place in the NEI. Sample flares had been made up by the NEI Civil Aviation Department and sent to Sydney for testing, where they were approved, but they were still not in service. Qantas had also sent photographs and specifications of an improved and more durable type of flare developed in Sydney. When Qantas Operations Manager Lester Brain wrote to the Qantas agents in Sourabaya, Burns Philp & Co Ltd, setting out the requirements for the planned pre-dawn departure, he even offered to have flares made up in Sydney and sent to Sourabaya.⁴¹

Japanese proving flights continue

Shortly after Hodder and Neilson arrived in Dili, the third Japanese proving flight left Yokohama, Japan, for Dili via Palau. Once again the aircraft was a Kawanishi Type 97, this time J-BFOY, *Sazanami* (Ripples). On this occasion the aircraft alighted outside the harbour in a series of huge bounces, disappearing in a cloud of spray after each bounce, much to the amusement of spectators. For the first time, Australians were able to see the aircraft “in the flesh” and Hodder snapped a few photographs of it at its moorings. He later reported that “no attempt was made to camouflage the gun turret in the tail between the twin rudders” and that “no goods of a commercial

nature appeared to have been carried and the flight was of a military character throughout”.⁴²

Once again the *Neishi Maru* accompanied the flying-boat to Dili. The vessel anchored in the harbour, just offshore from the Post Office, but when it used its transmitter it blotted out all reception by Aeradio. Hodder advised Pat Luz that under international radio-telecommunication regulations, ships were prohibited from using their transmitters while in port. Pat Luz protested to the Governor, who in turn instructed the Japanese that on flying-boat days the ship must move outside the harbour. After a two-day stay, *Sazanami* departed Dili northbound at 0530hr on the morning of Sunday, January 26.

A month later, on February 22, 1941, the fourth Japanese proving flight left Yokohama for Dili via Palau. In a bit of troublemaking, Dai Nippon Kōkū also put out a statement to the press at this time, claiming that the fortnightly QEA flying-boat service had been suspended and that all British South Pacific air routes were being transferred to Pan American Airlines.⁴³ This, of course, was completely untrue; the famous Horseshoe Route linking Britain with Australia and New Zealand, and its Hong Kong branch service, would continue to operate for another year yet.



NEXT TIME *The author concludes the story of one of the strangest episodes in Empire Flying Boat history with their use in espionage activities on Portuguese Timor in the critical early days of the Pacific War*

- 1 Kershaw, Ian, *Fateful Choices: Ten Decisions that Changed the World 1940–1941*, Penguin, 2007
- 2 Hudson Fysh, W., *Qantas at War*, Angus & Robertson, 1968
- 3 Johnston, E.C., Ross, D. and Bradfield, K.N.E., *Report on Visit to Portuguese Timor 29th December, 1940, to 1st January, 1941*, Melbourne, January 23, 1941. SECRET. Copy 29 in the Civil Aviation Historical Society (CAHS)/Bradfield collection, Box 18
- 4 *Timor Island: Importance to Australia: Proposed Air Service*, in the *Cairns Post*, July 31, 1939, p11
- 5 *Portuguese Timor: Use in Proposed Air Services in the Sydney Morning Herald*, August 10, 1932, p12
- 6 *Timor Island: Britain May Purchase: Link With Australia* in the *Cairns Post*, March 12, 1934, p7
- 7 Mr H. Fitzmaurice, UK Consul-General in Batavia, to Mr A. Eden, UK Secretary of State for Foreign Affairs, Dispatch 130 BATAVIA, September 2, 1937. Copy attached at Australian Archives (AA): A816 19/301/587
- 8 Ibid
- 9 Reported in *PROPOSED AIR SERVICE DARWIN TO DILI (PORTUGUESE TIMOR)*, Cabinet Submission by Mr H.V.C. Thorby, Minister for Civil Aviation. Agenda 603, March 14, 1939, AA ref A2694 Vol 16
- 10 Quoted in Thorby, *ibid*
- 11 Ibid
- 12 Thorby, Cabinet Submission, *ibid*
- 13 Reported in Commonwealth Government to Sir Thomas Inskip, UK Secretary of State for Dominion Affairs, cablegram 39, April 6, 1939. AA ref A1608 L52/1/1
- 14 The Guinea Airways party included Operations Manager G.H. "George" Archibald, Chief Engineer Jack Gething and the aircraft's crew, Captains D.G. Cameron (Chief Pilot) and E.D. Scott: *Timor Survey/ Official Flight Tomorrow in The Age* (Melbourne), July 21, 1939, p10. Additional information from Guinea Airways historians Fred Niven and Nigel Daw
- 15 *New Airline Planned: Darwin—Timor: Minister's Survey Flight* in the *Sydney Morning Herald*, July 24, 1939, p11
- 16 Ibid. Some six months earlier during the 1938 Christmas mail charters ANA DC-3 VH-UZK *Kurana* had become the first aircraft to arrive in Australia from a foreign port and depart for overseas on the same day
- 17 The Portuguese government was formally approached in August 1939 for a ten-year reciprocal and exclusive agreement for a Darwin—Dili service; see Commonwealth Government to Sir Walford Selby, UK Ambassador to Portugal, cablegram unnumbered, August 10, 1939, AA ref A981 AVIATION 50. Agreement was reached in December 1940
- 18 Hudson Fysh, *op cit*
- 19 *Sydney Morning Herald*, July 24, 1939, *op cit*
- 20 There is evidence that Japan was prepared to consider threatening a blockade of the Portuguese colony of Macao to achieve its aims in Portuguese Timor; see Mr A.T. Stirling, External Affairs Officer in London, to Department of External Affairs, cablegram 22 LONDON, January 9, 1940; AA ref A981 TIMOR (PORTUGUESE) 22, *iv*
- 21 Hudson Fysh, *op cit*
- 22 Johnston, Ross and Bradfield, *op cit*
- 23 *Japanese Airline Plans: Service to Timor* in the *Sydney Morning Herald*, November 15, 1940, p10
- 24 The Allied codename for the transport version was *Tillie*, but the type is better known as *Mavis*
- 25 Francillon, Rene J., *Japanese Aircraft of the Pacific War*, Putnam & Company, London, 1979
- 26 The Civil Aviation party had commenced its long journey from Melbourne on Boxing Day with a flight to Sydney. The following morning the group boarded the Short S.23 at Rose Bay, arriving in Darwin on the afternoon of the following day. The next day the S.23 flew to Koepang, where drums of fuel were taken on for refuelling at Dili. The aircraft then followed a course around the south coast of the island to a point approximately south-east of Dili where it changed to a northerly course to cross the island, then west along the coast to Dili, arriving about 1100hr; Johnston, Ross and Bradfield *op cit*. Aircraft identity is in the logbook of Capt H.B. Hussey, copy in the SAAM collection; logbook does not include the stop at Koepang, but total flight time for the day (12hr 53min) is 4-hr greater than normal time for this leg, indicating a stop at Koepang
- 27 This section is largely based on Johnston, Ross and Bradfield, *op cit*
- 28 Bradfield, Dr K.N.E., *Captain Edgar Charles Johnston — His Role in Australian Civil Aviation 1921–1957*, Edgar Johnston Memorial Address presented to the CAHS in Melbourne on May 20, 1992, CAHS
- 29 See *Qantas Beat Japan to Australia—Dili Link* in *The Courier-Mail* (Brisbane), October 17, 1941, p3
- 30 Francillon, *op cit*
- 31 Bradfield, Dr K.N.E., *op cit*
- 32 Aircraft identity confirmed by Capt Orm Denny, Pilot's Log Book No 2 (C.A. Form 7), copy via CAHS
- 33 Hodder, Ivan, *The Story of Aeradio Services in the Northern Territory and Portuguese Timor Areas*, audio recording c 1984 via CAHS, and *First Pirate?* in the *Journal of the Radio Amateur Old Timer's Club of Australia*, March 1987. McEwen was acting as Minister following the death of Fairbairn and other high-ranking personnel in an RAAF Lockheed Hudson accident on approach to Canberra on August 13, 1940
- 34 Portuguese airline *Serviços Aereos da Colonia Portuguesa Timor* had opened a fortnightly service from Koepang to Dili in October 1940. The aircraft was registered in Portuguese Timor but it was owned by KNILM. All the operational personnel of the airline were also supplied by KNILM. See Hudson Fysh, *op cit*. Also *New Timor Air Service* in the *Sydney Morning Herald*, October 2, 1940, p11 and *Air Communications: Japan Stretches Out in the Morning Bulletin* (Rockhampton), December 4, 1941, p8
- 35 *Air Service to Timor* in *The Examiner* (Launceston), January 15, 1941, p4
- 36 *Empire Air Service* in the *Morning Bulletin*, January 17, 1941, p6
- 37 *Morning Bulletin*, *ibid* and *First Airboat for Dili in the Northern Standard* (Darwin), January 21, 1941, p4
- 38 AWA — Amalgamated Wireless Australasia
- 39 Hodder, Ivan, *History of Air/Ground Communications in Northern Territory Areas and Darwin in Particular*, unpublished typescript, November 1985. This and following sections are based on accounts by Hodder in the CAHS archives incl *Intelligence Report on Portuguese Timor*, memorandum for Director of Intelligence, RAAF Headquarters, February 25, 1941; *The Story of Aeradio Services in the Northern Territory and Portuguese Timor Areas* and *First Pirate?*, *op cit*
- 40 Hudson Fysh, *op cit*
- 41 L.J. Brain to Burns Philp & Co Ltd, Sourabaya, letter, February 26, 1941, copy misfiled in Qantas Heritage Collection: C4 Catalina General.
- 42 Hodder, Ivan, *Intelligence Report on Portuguese Timor*, *op cit*
- 43 *New Japanese Air Service: Yokohama—Timor Air Route Surveyed in the Sydney Morning Herald*, February 26, 1941, p12



nattjakt!

THE D.H.112 VENOM IN FLYGVAPNET SERVICE

When Sweden's Mosquito NF.19 nightfighters began showing their age in the late 1940s, the same company's jet-powered Venom appeared to be the ideal replacement. Although considered a transitional type by *Flygvapnet*, the J 33 remained in service throughout the 1950s, and four saw civilian use for a decade beyond that, as **JAN FORSGREN** relates

BY THE END of the 1940s the de Havilland D.H.98 Mosquito NF.19 nightfighters of *Flygvapnet* (the Royal Swedish Air Force) were beginning to experience severe maintenance and fatigue issues, and a replacement had to be found urgently. Of the 60 Mosquitoes delivered to *Flygvapnet*, no fewer than 23 were written off in crashes (see *Sweden's Midnight Mosquitoes* in *TAH6*).

It had been intended to replace the Mosquito with the homegrown Saab J 32B Lansen jet fighter, but the latter would not be ready for several years. Consideration was also given to ordering the Gloster Meteor NF.11, which, in the event of an order, was to be fitted with a Swedish-built de Havilland Ghost jet engine and a Saab-developed

ejection-seat. The Meteors would have been built in the UK by Armstrong Whitworth Aircraft Ltd, which assigned the project number AW.62 to the prospective Swedish order. However, the de Havilland DH.112 Venom was selected instead, with 60 being ordered in 1951.

A MOSQUITO REPLACEMENT

Following a brief evaluation, 35 Venom NF.51s, as they were designated by the manufacturer for Swedish export, were ordered on January 2, 1951, with an option for another 25. The NF.51 was essentially similar to the RAF's NF.2, differing only in the radio and navigational equipment fitted. Ghost engines licence-built by *Svenska Flygmotor AB* in Sweden were shipped to Britain



for installation, as were the 20mm Hispano cannon (also built under licence in Sweden). One added piece of equipment was a foldaway ladder, to be used when the Venoms were operating from small, temporary air bases. The radar suite fitted was the PS-20/A (RAF designation AI Mk X), which had also been fitted to the Mosquitoes. Interestingly, British records state that 62 Venom NF.51s were ordered, but Swedish records show that the number delivered was 60. To this day, this discrepancy of two aircraft remains unexplained.

Before delivery, the aircraft were flown by Swedish test pilot Bo Bjernekull. On the last dozen Venoms, stall speeds varied by up to 10 m.p.h. (15km/h) on individual aircraft. Investigation revealed that this was due to the paint finish. When originally applied, the paint on the leading edges was prone to flaking off because of rain or hail. To improve the camouflage scheme, a spray-paint gun was used, which meant that a layer of spray dust settled in the areas concerned. This was soon rectified by checking the wing surfaces thoroughly during and after painting.

INTO FLYGVAPNET SERVICE

The Flygvapnet designation J 33 was assigned to the Venom (J for *Jaktflygplan* — fighter aircraft). On December 20, 1952, the first Flygvapnet Venom (serial 33001) arrived in Sweden, being taken on charge on January 14, 1953. All of the remaining aircraft were flown to Sweden, with one (33014) being lost in a fatal pre-delivery crash at Chester on August 12, 1953. The final aircraft arrived in August 1954. All of the Flygvapnet Venoms served with Wing F 1 based at Västerås-Hässlö, to the west of Stockholm.

In 1953 tentative plans called for an additional 30 Venoms to be ordered for use as interim reconnaissance aircraft. This did not materialise, however, and neither did plans in late 1953 to modify one J 33 for electronic surveillance duties.

In order to ease conversion training, several

ALTHOUGH THE J 33 remained fairly unknown outside Sweden, one amazing photograph of it, seen on the title page **OPPOSITE**, made headlines around the world.

This dramatic image, taken by Bo Bjernekull, shows the Venom from directly ahead hurtling through what looks like a meteorite belt — actually a snowstorm — at night. How did it come about?

Having completed a daylight photo-mission with the type, Bjernekull was keen to capture the nightfighter during a night sortie over Västerås, as no such photos had been taken before. Planning the sortie down to the last detail, Bjernekull suggested photographing the J 33, flown by Gunnar Börjeson, from the open lower-fuselage hatch of a Saab B 18B, to be flown by Gösta Hedén. Squeezed into the Saab, along with his Rolleiflex automatic camera and a bulky electronic flash unit, Bjernekull shot one roll of film and two exposures from a second roll of film. Noticing that they were passing through a snowstorm, Bjernekull feared that this would reduce visibility and separate the B 18B and J 33. The electronic flash unit was set at 1/5000sec, the Rolleiflex camera shutter at 1/25sec and the diaphragm preset at f/3.5. Lying on the floor of the B 18B with his fingers having become numb in the freezing cold, Bjernekull opened the second roll of film with his teeth.

After getting back to the photo lab, Bjernekull developed the negatives. One of them contained the dynamic photo of the J 33, with the city lights of Västerås clearly seen, as intended, slightly elongated. However, it was the snow which really made the image stand out from the rest. Bjernekull's photo was published in many different magazines around the world, including the December 13, 1954, edition of *Life*. **JF**

de Havilland J 28 Vampires were loaned to F 1 and, for a brief period, the Wing operated three different types of de Havilland aircraft: Mosquito, Vampire (both J 28A and B, i.e. F.1 and FB.52) and Venom. The first of Wing F 1's three units to convert to the Venom was No 1 Sqn. By mid-1954

BELOW The third Venom NF.51, serial 33003, at the de Havilland factory at Hawarden, near Chester, in May 1953, beside a pair of Swedish Vampire trainers, designated J 28C in Flygvapnet service. The J 33's original fin/tailplane junction, seen here, incorporated forward-facing "acorn" fairings, but these were later relocated aft of the tailplane.

BAE SYSTEMS



A rare colour photograph of a J 33, in this case 33008, in the UK before delivery circa 1953–54. The Venoms were painted in the same camouflage colours, Medium Sea Grey and Dark Green, as their Mosquito nightfighter predecessors, with Tre Kronor (Sweden's three-crowns emblem) roundels applied to the tailbooms and on the upper and lower surfaces of the wings. BAE SYSTEMS



BELOW RIGHT The Venom was fitted with airbrakes immediately outboard of the tailbooms; they are seen here in the fully open position. Also visible on this J 33 are the wing fences incorporated to eliminate tip stall during low-speed flight. The Venom's distinctive 75 imp gal (340lit) tiptanks were the first ever to be fitted to an RAF fighter.

full pilot conversion from Mosquito to Venom had been completed. The initial batches of navigators received training in converted Junkers B 3s (Ju 86Ks), replaced by Percival Pembroke in 1956.

The nightfighter crews of F 1 (Flygvapnet's only nightfighter Wing) felt confidence in the new jet fighters. The Venom had overall better performance than the Mosquito (apart from endurance), which meant that a different set of tactics had to be developed, and a series of trials was devised to investigate optimum range and suitable attack techniques. An infra-red binocular, tested on the Mosquito, was further developed and fitted to all J 33s forward of the windscreen. Its use was limited by the target's engine exhaust temperature, as well as by clouds and ice. The binocular was top secret, and therefore had to be removed from the airframe after each sortie. Normally, each crew of pilot and navigator flew regularly together, which made for excellent teamwork and a deeply-founded trust in each other's abilities.

In 1954 the state-of-the-art Venom was the star of a short movie called *Nattjakt* (Night Hunting), a 15min black-and-white film showing the Venom in operational service, including a (scripted) radio-failure incident. Some of the night aerial sequences were filmed from Flygvapnet's sole Avro Lancaster.

To show off the new nightfighter, a J 33 display team, comprising four Venoms, was formed in 1956. Over the next three years the team displayed at about a dozen air displays — including one at night. The latter took place on May 11, 1958, at



BAE SYSTEMS

Wing F 1. Spotlights were fitted to the inboard exterior of the tiptanks of the lead Venom, with the light shining on a small area behind the canopy. Owing to safety concerns, however, the night display was not repeated.

MODIFICATIONS

The aircraft of the initial batch of 29 Venom NF.51s (33001–33030, with the exception of 33014) were externally indistinguishable from the RAF's NF.2s. However, initial experience with the Venom by the RAF and Flygvapnet revealed that the type suffered from a number of deficiencies, including poor flight characteristics at high speed.



ABOVE Flygvapnet J 33 serial 33019 takes off at Hawarden during a test flight on July 2, 1953. The Venom was essentially a development of the same company's Vampire, designed to exploit the de Havilland Ghost turbojet, a scaled-up version of the Vampire's Goblin, although the various changes made the Venom virtually a new design.

The resulting modifications included the fitting of a new canopy, which would ease crew egress in case of an emergency. The Venom was not fitted with ejection-seats, owing to a lack of space, so, in order to bale out, the pilot had to roll the aircraft on to its back, after which the crew would drop out of the cockpit. The twin fins were extended forward along the tailbooms and the tops of the fins were slightly cropped. Additionally, in order to improve the aircraft's aerodynamic flow, the "acorn" fairings at the junction of the fin and leading edge of the tailplane were relocated to the trailing edge. The necessary modifications were performed by the *Centrala Verkstaden Västerås* (CVV — Air Force Workshop at Västerås), assisted by a number of seconded British technicians. The second batch of Venom NF.51s (33031 to 33060) all incorporated the above modifications.

The Venom's lack of ejection-seats was the sub-

ject of a Swedish Royal Air Board investigation. French Sud-Est Aquilons (licence-built Venoms) featured ejection-seats, made possible by installing a smaller radar suite than those fitted to Flygvapnet and RAF Venoms. British company Folland showed interest in undertaking the necessary development work to fit ejection-seats in the NF.51s, using one of the yet-to-be-delivered Venoms, but nothing ultimately came of it. By November 1956 the revised clamshell canopy had been retrofitted to the initial batch of J 33s. New improved brakes as well as wing leading-edge slats were also fitted.

The J 33 was subject to continuous testing and modifications throughout its service career, including trials of the PS-30/A radar suite, infrared binocular, windscreens wipers (hydraulic and electric) and most suitable radome paint as well as brakes and engine performance.

BELOW With the "clamshell" canopy and revised tail arrangement, this J 33, coded "E", awaits its next sortie in Sweden. Flygvapnet's sole nightfighter Wing, F 1 had three squadrons, which were the only units to operate the type. Note the pair of North American Sk 16s and a Junkers B 3, as used to train J 33 navigators, in the background.

via author





ABOVE A dynamic air-to-air photograph emphasising the J 33's distinctive twin-boom planform. Despite the type's similarity to the Vampire, the Venom's wing was entirely new, a square-tipped unit of very thin section, with a straight trailing edge and 17.6° sweep on the leading edge.

LEFT The cockpit of the two-seat Venom was somewhat "cosy", especially with the original framed canopy, as seen here. Not fitted with ejection-seats, the J 33 presented a challenge in the event of the crew having to bale out. The proximity of pilot and navigator did, however, create a beneficial environment for close teamwork.

BELOW Venom 33017, coded "A", having come to its final resting place after a belly landing. Interestingly, this J 33 has the original canopy but the revised fin and tailplane arrangement, with the acorn fairings relocated aft of the tailplane, a modification made to reduce the possibility of tail buffeting at high speed. VIA AUTHOR



"Smile, please!" — with wheels and flaps down, Venom 33057 poses for the camera during an aerial photography sortie on April 6, 1954. The type's thin-section wing necessitated a redesign of the original Vampire undercarriage, incorporating mainwheels of larger diameter and thinner section, with single-disc hydraulic brakes.



One little-known aspect of Flygvapnet night-fighter operations was an RAF crew-exchange programme. On January 2, 1959, Uno Andersson (pilot) and Olle Norling (navigator) left Sweden for six months of exchange duty with the RAF. The first three months were spent at Leeming, where Andersson and Norling received conversion training on a Meteor T.7, and were also cleared to fly the Gloster Javelin FAW.5. An interesting detail was that the Javelin lacked the infra-red gunsight already in use on the J 33. The Swedes also served with Javelin-equipped No 151 Sqn at RAF Leuchars. In exchange, one RAF nightfighter crew (pilot Langstaff and navigator Gilliat) served with Wing F 1. The pair flew a number of sorties in J 33s, albeit always in company with a Swedish pilot or navigator.

VENOM LOSSES

Some 12 Flygvapnet J 33s were written off in crashes. Eight were lost in 1959 alone, one the result of an incident in which both pilot and the unconscious passenger were carried to the ground by the same parachute!

One near-fatal incident occurred on November 2, 1954, when Sven-Olof Olson (pilot) and Jack Carlsson (navigator) suffered an engine failure at 9,000m (29,500ft). According to Olson, the experience of sitting in complete silence after the engine stopped was overwhelming. All efforts to restart the Ghost engine were in vain. "Stepping out" of the Venom posed several problems. The (then-unmodified) canopy was narrow, resulting in a high risk of the airmen striking a part of the airframe after baling out. After discussing the problem with air traffic control (ATC) at Västerås,

Olson decided to try to return to the base in the jet-turned-glider, maintaining around 305km/h (190 m.p.h.). At 3,000m (9,800ft) Olson and Carlsson passed through cloud, resulting in a thick layer of ice forming on the windscreen, making it difficult to see out of the Venom. Arriving overhead F 1 at 1,800m (6,000ft), Olson and Carlsson made final preparations for a dead-stick landing. Happily, this went fine, both crew and aeroplane arriving back on *terra firma* without a scratch; a result of excellent teamwork between the crew and ATC. Following the failure of the engine, the flight back to Västerås had lasted some 22min, possibly a world record for a combat aircraft after flame-out. In 1982 Olson was promoted Commander-in-Chief of Flygvapnet, a position he held until retirement in 1988.

On October 1, 1960, the J 33 was officially withdrawn from service, the surviving aircraft being formally struck off charge on October 24. The aircraft had seen heavy usage, one aircraft (33018) accumulating some 864 flying hours. The first J 32B Lansens had arrived at F 1 the year before. Four of the Venoms, however, were to see further use for another decade.

CIVILIAN USE

When, in 1957, civilian company *Svensk Flygtjänst AB* (SFAB — Swedish Air Service Ltd) received a contract to operate the Australian-built GAF Jindivik drone, the Royal Air Board assigned two J 33s for use as drone-controllers. The Venom was deemed appropriate, having a similar speed range to that of the Jindivik, a suitable service ceiling, a two-man crew (pilot and drone-controller) and enough space for the electronic equipment.



ABOVE Four J 33s were used by civilian organisation Svensk Flygtjänst AB as drone-controllers for Sweden's Jindivik target-drone programme. Initially retaining Flygvapnet camouflage, the four were ultimately painted in a high-visibility yellow scheme, seen here applied to SE-DCD. Note the original serial, 33025, on the rear of the boom.

Accordingly, two J 33s (33015 and 33022) were selected and flown to Malmslätt, where they were modified by *Försökscentralen* (Fc — Flygvapnet's equivalent of the UK's Royal Aircraft Establishment). The conversion included the removal of the cannon and radar, equipment for drone-tracking being fitted in its place. As the aircraft were to be operated on the civil register, the navigation and radio avionics would have to comply with civilian flight regulations. The Venoms were registered SE-DCA and 'DCB' respectively. When the last Flygvapnet J 33s were struck off charge in 1960, two additional Venoms (serials 33025 and 33041) were assigned to SFAB, becoming SE-DCD and 'DCE' respectively.

The SFAB Venoms were operated from the top-secret Vidsel base in northern Lapland, known as *Robot Försöksplats Norrland* (RFN). Initially, the Venoms retained their Flygvapnet camouflage but were later given an overall yellow finish. The Jindivik was normally controlled from the ground during test flights, with the Venom acting as a backup in case of a malfunction. When the Jindivik was withdrawn in 1964, other tasks were assigned to the Venoms, including the testing of the drogue target SM 1 and various types of flares. The Venoms also carried a variety of air-defence-missile systems which were tested at Vidsel.

The Venom proved itself to be a relatively trouble-free aircraft in civil service, despite two notable incidents, both involving SE-DCA. In April 1961 the aircraft undertook a belly-landing

DE HAVILLAND DH.112 VENOM NF.51 DATA

Powerplant 1 x de Havilland Ghost 103 turbojet engine of 4,850lb-static thrust

Dimensions

| | | |
|-----------|-----------|----------|
| Span | 42ft 11in | (13.08m) |
| Length | 33ft 1in | (10.08m) |
| Height | 7ft 7in | (2.3m) |
| Wing area | 279½ft² | (25.9m²) |

Weights

| | | |
|------------------|----------|-----------|
| Maximum take-off | 15,800lb | (7,167kg) |
|------------------|----------|-----------|

Performance

| | | |
|-----------------|-------------|--------------|
| Maximum speed | 630 m.p.h. | (1,014km/h) |
| Initial climb | 8,760ft/min | (2,670m/min) |
| Service ceiling | 49,200ft | (15,000m) |
| Range | 1,000 miles | (1,600km)) |

at Wing F 21 at Luleå in northern Sweden, and in August 1963 it was slightly damaged in a landing accident at Vidsel. Following the latter, SE-DCA was withdrawn from service and allocated to emergency rescue training. The last Venom was withdrawn from use in 1969, with the last flight occurring in March of that year.

Two Venoms remain in Sweden, both owned by *Flygvapenmuseum*. On display at Malmslätt is 33025 (SE-DCD), while 33015 is on long-term loan to the RFN Museum at Vidsel, being finished in its SE-DCA colours.



MORE: *The J 33 pilot's perspective* →

whistling in the DARK

FLYING THE J 33 IN FLYGVAPNET SERVICE

Former Flygvapnet Mosquito and Venom pilot **BENGT “KÄVLINGE” LINDWALL** accrued hundreds of hours on the J 33 and recalls converting from the piston-engined Mosquito to the jet nightfighter and what it was like to fly

IN THE SUMMER of 1953 I was honoured to be chosen to pick up a J 33 from the factory at Chester and fly it back to Sweden via Hatfield. During the preceding months I had flown the Vampire for about 50hr, which provided me with my initial jet experience. I had accumulated only 5hr on the Venom when I took off from Hatfield and headed for home at 13,000m (43,000ft), landing at Västerås 95min later.

During the pre-delivery test flights at Chester I had been overtaken by company test pilot John Cunningham in a Comet 4 during a test flight. The ignominy of being overtaken by an airliner while flying a jet fighter did not matter when the Comet was being flown by such an illustrious airman!

GETTING TO GRIPS WITH THE VENOM

The J 33 was a wonderful aeroplane to fly, and provided a considerable strengthening of Sweden's air defences in poor weather and at night. During training sorties, we normally operated at altitudes of 12,000–13,000m (39,000–43,000ft) and, carrying special oxygen masks, occasionally up to 16,000m (52,500ft). When we were equipped with infra-red sights, in the greatest secrecy, we were able to attack during a turn, which of course was a great step forward during night sorties. One problem we faced occasionally was synchronising our speed when we had to make a steep dive from altitude to attack slow and low-flying targets. Over the Baltic Sea, our experienced radar operators at times had difficulty in differentiating



AUTHOR'S COLLECTION

ABOVE The author during his period as a J 30 Mosquito nightfighter pilot. Along with his radar operator, the author accrued some 1,100 flying hours in the J 30 Mosquito and J 33 Venom — possibly a Flygvapnet record.

BELOW Another rare colour photograph of 33008 in the UK before delivery. Note the original taller fins, later replaced with shorter kidney-shaped fins and rudders to prevent excessive yaw and possible rudder-locking at low speed. BAE SYSTEMS





ABOVE Contained within the bulbous radome of the J 33 was the scanner for the same PS-20/A (SCR-720B) radar suite, known as Al Mk X in RAF service, fitted to its predecessor, the J 30 Mosquito. Note also the apertures on the underside of the fuselage for the nightfighter's four 20mm Hispano cannon and the original framed canopy roof.

such aeroplanes from small ships. The J 33 was excellent to fly on instruments, with our time before an attack being reduced to 3–4min.

This inadvertently saved me and my radar operator on one occasion. During one night training flight, we were at 13,000m over Norrköping, some 200km (125 miles) south of Stockholm, performing practice attacks. We had taken off from Wing F 8 at Barkarby, north of the capital, where we were temporarily based. The ground-controlled interception (GCI) officer was leading us towards the target. He knew us well, and we hadn't reported that we had sighted the target after about 10min, so he asked us how we were doing and to check our oxygen. As usual, I had turned the oxygen to 100 per cent on take-off, and it was OK. However, looking to my right, I noticed that my radar operator did not seem OK. I set course northwards for Barkarby, and reduced engine power to idle, extended the divebrakes and put the nose down to reduce

altitude quickly. I too began to feel queasy, but managed to steer towards F 8. The capital was sprawling underneath us like a giant squid, with the lit-up approaches being its arms. At 7,000m (23,000ft), I inexplicably — and as it turned out, luckily — ripped off my oxygen mask before bringing us into a landing pattern.

After a safe landing, feeling quite dazed, I taxied towards the parking area. I parked the aeroplane, applied the handbrake and fainted. When the canopy was opened, I awoke after breathing in fresh air and climbed out of the seat. However, I fell out of the cockpit on to the tarmac. Both I and my radar operator were immediately transported to hospital.

What had happened? Some kind of chemical fluid had been mixed into the fuel in order to keep the engine nozzles clean. However, the fumes had entered the cockpit via the heating system. The next night, however, we were airborne again in another Venom.

BELOW With its short undercarriage enabling easy access to all parts of the airframe and powerplant, the J 33 proved to be a rugged and adaptable nightfighter, capable of operating in the harshest Arctic winters. The revised clamshell canopy, seen here, was a great improvement over the original, as fitted to the J 33 in the photo above.

VIA AUTHOR





ABOVE Although Flygvapnet regarded the J 33 as an interim aircraft, the type remained in front-line service for seven years, before being replaced by the Swedish-designed and -built Saab J 32B Lansen. The last of the RAF's Venom NF.2s and NF.3s were retired from squadron service in late 1957, and the Royal Navy's Sea Venoms in 1960.

Another time when things could have gone differently was during a solo flight in a J 33. I was practising fighting turns against another Venom at 7,000m (23,000ft) north of Västerås. My J 33 was inverted and in an almost vertical climb with the target beneath when the stick suddenly locked in a forward-port position. Somehow, by means of brute force, I managed to centre the stick while carefully applying rudder to get the aeroplane on an even keel and head for home, descending with the help of the rudder trim and by alternately applying and reducing engine power. Baling out was out of the question, as it would have entailed performing a 180° roll to get out of the aircraft's cockpit. I planned that if I got down to low altitude and flew low across the open farmland towards F 1 at low speed I would be able to belly-land if it became impossible to control the fighter.

In the event, however, I did manage to make a wheels-down landing at F 1. It was soon found that a lost screw or similar had stuck in the drive-chain mechanism of the stick, resulting in a locked control column. All J 33s were immediately grounded until a thorough check for any similar problems had been conducted.

FORMATION AEROBATICS — AT NIGHT

As an experienced J 33 pilot, I was honoured to become a member of the formation aerobatic display team, in which I flew as No 3 in the four-aircraft formation. During the day we performed all kinds of manoeuvres, including changing positions etc. We were all very experienced pilots and we performed about a dozen displays. Apart from the regular formation display, I also flew a solo spot.

The J 33 was very much a pilot's aeroplane, with wonderful handling characteristics. After a while, we received special permission from the Commander-in-Chief of Flygvapnet to perform night displays. A couple of landing lights from a Mosquito were fitted to the inside of the tiptanks on the lead Venom, which provided enough light for us to be able to keep formation. It was really important to keep your spot, otherwise you would not be able to keep formation.

Everything was completely dependent upon the skills of the lead pilot. Any advanced manoeuvres were out of the question, with the display being limited to some wide-arc turns. Seen from the ground, our display looked rather spectacular. To my knowledge, our J 33 display team was the only one of its kind to perform night displays.

My solo spot consisted of flying past the spectators while performing a series of rolls. On the wing-tips of my J 33, the fuel tanks had been removed, and in their place magnesium rods emitting a strong light had been fitted.

My rather long tenure as a Flygvapnet night-fighter pilot, and all the flying hours spent at the controls of two different yet equally fantastic de Havilland products, was the most enjoyable time of my long flying career. It was during this period that I learned what real flying is all about, as well as excellent comradeship, which was hugely beneficial for my subsequent career as a civilian pilot.



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THE USAAF'S

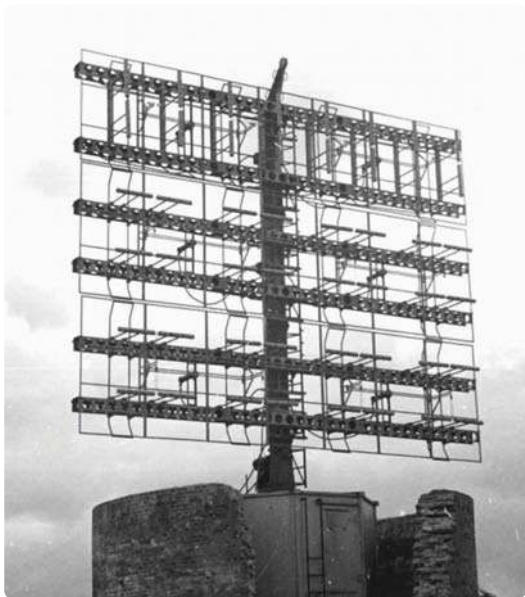


MEDITERRANEAN FERRETS

THE 16TH RS & ELECTRONIC COUNTERMEASURES IN THE MTO, 1943–44

During the Second World War the advent of radar technology brought about a new kind of aerial conflict — electronic warfare. The Germans certainly had radar — but how did it work and, crucially, could it be jammed? **BILL CAHILL** examines the vital electronic countermeasures work performed by the USAAF's 16th Reconnaissance Sqn in the Mediterranean





LEFT Germany's Freya radar was an early-warning system first used operationally on December 18, 1939, when two stations detected an incoming raid on Wilhelmshaven by RAF Vickers Wellingtons and directed fighters towards the raiders. Freya was often used in concert with the Würzburg gun-laying system, the former detecting targets at long range before "handing them off" to Würzburgs for tracking.

IT HAD BEEN a rough December for the USAAF's 16th Reconnaissance Squadron (RS), based at Foch Field in Tunisia. Holidays in combat zones are never enjoyable and this was the unit's first. The weather was dreary, news of promotions for the squadron's officers was late; even the Italian PoWs, usually cheerful, were unusually morose because no mail from Italy had been delivered for more than a month. Then it happened. On December 6, 1943, Boeing B-17E serial 41-9016 was late in arriving back from an overnight mission along the Mediterranean coast of France hunting German radars. Search aircraft were sent out but returned without sighting any wreckage, lifeboats or signs of life. The aircraft had simply disappeared. The search was in vain, however, as the aircraft, off course and in bad weather, had ploughed into a mountain peak in Spain, killing all aboard.

Just as morale started to improve in January with the arrival of Christmas care packages and promotions, it happened again. On the morning of January 26, B-17F 42-30379 was reported as missing. Although combat losses were normal for B-17 crews, the 16th RS operated only five B-17s in the comparatively benign role of night radar reconnaissance. Maybe the unit had just encountered a streak of bad luck?

FERRET'S BIRTH

In October 1942 the USAAF flew its first electronic intelligence (ELINT) mission using a modified B-17E bomber, assigned to the Seventh Air Force's

11th Bombardment Group (BG). Prompted by the capture of a Japanese radar on Guadalcanal, the purpose of the mission was to map radars in the Solomon Islands. Equipped with a handbuilt Naval Research Laboratory (NRL) radar receiver, the B-17 flew a few missions, none of which picked up any Japanese signals. This early lack of success, however, did not stop the USAAF from continuing its quest to intercept radar signals.

In November 1942 a photo-recce mission in the Aleutians revealed a probable Japanese radar installation on the island of Kiska — and the race was back on again. Project *Ferret*, signed off by Chief of Staff of the Army Air Forces General Henry "Hap" Arnold, called for the Aircraft Radio Laboratory (ARL), in conjunction with the NRL, to modify a Consolidated B-24D for the ELINT role. The modified B-24D, 41-23886, named *Ferret I*, deployed to Adak, Alaska, in February 1943, and after weather delays flew its first operational mission over the Aleutians on March 6.

After two additional missions to map the location of two radar sets identified on Kiska on its first sortie, *Ferret I* was returned to the ARL at Wright Field, Ohio. *Ferret II*, built using experience gained with *Ferret I*, had "inadequate" performance and remained at Eglin Field in Florida for test and training purposes.

RADAR FORTRESSES FOR THE MED

Fear of the unknown drove the next production series of *Ferrets*. While the Allies knew Germany had operationally deployed radar, little was known about the range of this equipment and the frequencies on which it operated — or even where it was located in the Mediterranean Theatre of Operations (MTO). The USAAF had a requirement to map German surface-search and early-warning radar in preparation for Operation *Husky*, the invasion of Sicily. Based on experience with *Ferret I*, as well as concurrent RAF airborne ELINT operations, the solution appeared to be bomber-based. Accordingly, three B-17Fs were allocated for conversion to the ELINT role, with their sensor suites based on that of *Ferret I*.

The first aircraft, B-17F-50-DL serial 42-29644, was designated *Ferret III* and sent to Wright

OPPOSITE PAGE Boeing B-17F serial 42-3358 Thunder Head is used as a backdrop for a photograph of its 16th RS crew and Rumanian soldiers at Ploesti in October 1944. The B-17 and its crew were in Rumania to pick up spare parts for the 16th RS's captured Würzburg radar at the unit's base at Foggia. ALL IMAGES VIA AUTHOR UNLESS OTHERWISE NOTED



ABOVE The core of what was to become the 16th RS, including Ferret crewmembers and Northwest African Air Forces (NAAF) administrative personnel, pose for a photograph in front of B-17F serial 42-3055 Ferret V at Foch Field, Tunisia, circa early August 1943. Note the unusual black mottled camouflage scheme applied to Ferret V.

Field and Boston, Maine, for its transformation. Additional fuel tanks were installed in the bomb bay and a radar observer's position was built in the radio room with racks for receivers and seats for two Radar Observers. Meanwhile, USAAF officers selected as Radar Observers underwent training at Boca Raton in Florida, while enlisted airmen received instruction on equipment maintenance. Concurrent with *Ferret* training and construction was another endeavour involving the active jamming of German radars.

Based in Cambridge, Massachusetts, Radio Research Laboratories (RRL) developed a pair of airborne "barrage-jamming" transmitters designed to counter Germany's two biggest radar threats. The RC-183 *Mandrel* was created to jam the German *Freya* early-warning and surface-search radar, and the RC-156 *Carpet* was designed to suppress the *Würzburg* gun-laying and fighter-control radar. In May 1943, 35 B-17s were modified to accommodate one of each type of jammer, with operators and maintenance personnel undergoing training at Boca Raton for deployment to the Mediterranean.

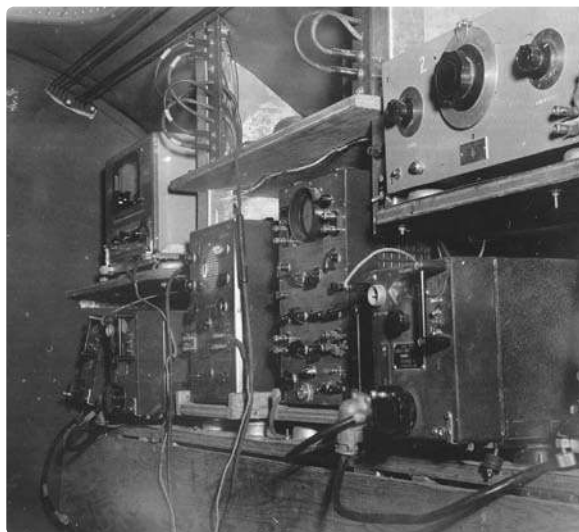
After a spell of training, *Ferret III* and its crew departed Morrison Field, Florida, for Algeria on April 22, 1943. Pilot 1st Lt Harold Millen took '644 via the southern ferry route of South America to West Africa via Ascension Island and on to RAF Blida, about 30 miles (48km) south-west of Algiers. Assigned to the 64th Troop Carrier Group (TCG) for rations and administration,

but essentially fending for themselves, the crew of *Ferret III* quickly found sympathy with the RAF's No 192 (Special) Sqn, at that time flying specially modified Vickers Wellington B.Xs on similar duties. *Ferret III*'s Radar Observers, 2nd Lts Matthew Slavin and Roger Ihle, chatted with their equivalents in No 192 Sqn and, with the help of RRL technical adviser Dr D.B. Sinclair, reconfigured the B-17, rearranging equipment for ease of operation and modifying their direction-finding antennas for improved accuracy.

Test missions were flown in early May 1943, with operational sorties starting on the 17th. In line with their RAF brethren, the *Ferret* crews operated at night, alone, 10–15 miles (16–25km) off the Italian coast. Missions were flown at low level, at around 500–1,000ft (150–300m), with the pilots flying visually without the benefit of navigation radar. By July 9 that year, when *Husky* was launched, *Ferret III* had completed nine missions, covering the coasts of Sardinia and Sicily, contributing valuable intelligence to invasion planning.

Back in the USA, the second spearhead of the electronic war against Germany was preparing to join the fight. On July 6, 1943, the 35 *Mandrel* and *Carpet*-equipped B-17s began to depart the USA for Algeria. Coming late to the dance, four were in place to support *Husky*, and, although their maintenance personnel were still en route via cargo ship, the four flew jamming operations during the invasion with support from *Ferret III*.

“COMPLETE MAPPING OF GERMAN RADAR EQUIPMENT ON THE ISLANDS OF SARDINIA, CORSICA AND ELBA FOLLOWED, AND BY LATE SEPTEMBER THE SQUADRON WAS STARTING TO SPREAD ITS WINGS TO TARGETS ACROSS THE MEDITERRANEAN . . .”



ABOVE LEFT *The Radar Observer's position in a 16th RS Ferret. Lower shelf, right to left: an AN/APR-4 receiver; Dumont 224-A Oscilloscope; SCR-587 receiver, and spare tuners for the latter. The upper shelf holds audio oscillators. ABOVE RIGHT* *Head of the AN/APR-5 installation team Lt Hovee poses beside his handiwork in July 1944.*

Meanwhile, *Ferrets* IV (42-29881) and V (42-3055) had left the USA together on June 20. Arriving at Blida in mid-July after delays in routing through Africa, the two new aircraft and their crews joined *Ferret III* in mapping German radars. With the initial stages of the invasion of Sicily completed, the Northwest African Air Forces (NAAF), part of Allied Mediterranean Air Command, searched for a suitable task for the *Ferrets*. Blida was far from any prospective action, so the three-aircraft *Ferret* detachment was ordered to move east to Foch Field near Tunis, on July 26. The detachment also acquired further structure; before departing for Foch, it was designated the General Reconnaissance (GR) Sqn and aligned under the Communications Section of the US Twelfth Air Force.

The unit absorbed the radar-jammer personnel, airborne jamming equipment and the four “orphan” jammers sent over to support the Sicily invasion, taking on a broader mission for the remainder of the war. The change in scenery also saw a change in equipment fit, the three *Ferrets* being updated with a much-needed navigation radar, the SCR-521, to aid in their nocturnal low-altitude mission.

OVER ITALY AND FRANCE

With Sicily secured by August 17, 1943, radar reconnaissance of the west coast of the Italian mainland began in earnest to support the planned American landings at Salerno in September.

Complete mapping of German radar on the islands of Sardinia, Corsica and Elba followed, and by late September the GR Sqn was spreading its wings to targets across the Mediterranean.

The unit's first mission off the coast of southern France was flown on September 24, 1943, followed over the next two days by missions in the Adriatic investigating Greece, the east coast of Italy and west coast of Yugoslavia and Albania. It was a busy autumn for the unit, with yet another reorganisation. The GR Sqn was redesignated the 16th Reconnaissance Squadron (Bomber) — RS (B) — on September 26, an action designed to ease supply and personnel challenges. Besides flying *Ferret* radar-reconnaissance missions, the 16th pursued two additional lines of effort — radar jamming and equipment upgrades.

Back on September 1, one of the four “orphan” jammer aircraft, B-17F-100-BO serial 42-30379, had been flown with *Ferret V*, 42-3055, on a mission to determine the effectiveness of *Mandrel* jamming against *Freyja* early-warning radars in the Cagliari area of southern Sardinia. The action appeared to stimulate the Luftwaffe, as '379 was attacked by flare-dropping nightfighters and flak. A follow-up mission on September 5 was tame by comparison, and allowed the Radar Observers to watch the German efforts to work around the *Mandrel* jamming.

With a growing interest in attacking the radio waves, the jammer section of the GR Sqn started to look for its 31 “lost” B-17s and accompanying



MAP BY MAGGIE NELSON

100 jamming equipment sets. After arriving in the MTO, the bombers had been assigned to four BGs within the Fifth Wing; BG maintenance personnel, unaware of the top-secret jammers and wiring, had removed them and put the bombers into regular service without the excess weight, damaging some of the equipment in the process. Eventually all 31 aircraft were accounted for, one having crashed by the time the search was completed. The remaining 30 were routed through Foch Field to have their wiring restored and jammers reconditioned in order to support Operation *Avalanche*, the invasion of southern Italy at Salerno planned for September 9, 1943.

The aircraft were apparently deemed to be of more value in their primary bombing role, and their jammers were again removed, not to be fitted again before *Avalanche*. The unit, however, did not give up that easily.

CARPET BOMBING

After *Avalanche*, there was a reluctance to use the jammers in support of daily bombing strikes lest they fall into German hands. After discussions within the NAAF staff, it was decided to equip one Twelfth Air Force BG with *Carpet* jammers as an experiment, to screen bomber formations from German flak. Chosen was the 97th BG located at Deppien, Tunisia, not far from Foch Field. After the jammer-configurable bombers were collected and forwarded to the 97th BG, by late September 1943 the 16th RS was in the jamming business,

installing and maintaining equipment through a pool of maintenance personnel that “commuted” to Deppien each day.

Before focusing solely on 97th BG *Carpet* operations, the 16th RS tried one experimental mission. Four jammer-wired B-17s of the 91st and 301st BGs were fitted with *Mandrel* transmitters to jam early-warning radars and sent on a raid into Italy accompanied by *Ferret IV*. Analysis by the unit showed that *Mandrel* jamming appeared to alert the enemy to an incoming raid and, based on this evidence, the focus was put on *Carpet* jammers instead.

By late October 1943 the 97th BG had commenced jamming ops and the 16th RS dispatched *Ferrets* to fly with its formations to observe the impact of the *Carpet* jamming on the Würzburg radars, as well as contribute some bombs to the target area. Missions flown on October 24 and November 2 against Wiener Neustadt in Austria, and on November 1 against La Spezia in Italy, allowed the *Ferrets* to monitor the effectiveness of jamming and scan for new German radars in the target area. Satisfied that the jamming was having the right impact, the 16th RS stopped flying with the daylight bomber formations.

Radar Observers were placed on detached service to the 97th BG to oversee operations and ensure the 16th was getting feedback on the performance of the jammers, as well as German tactics. Squadron maintenance personnel also installed SCR-587 receivers in aircraft of the

With Tunis visible in the background, 42-3055 Ferret V awaits its next mission at Foch Field in March 1944. This B-17F acquired its distinctive mottled camouflage scheme soon after its delivery to the 16th RS; it was probably applied "in-house" by squadron maintenance personnel for additional stealthiness during its solitary overwater night missions.



97th BG's 340th Bomb Squadron (BS) so Radar Observers could continue to monitor jamming results and German tactics to work around it.

In late December 1943 the 97th BG moved to Italy, although its relationship with the 16th RS did not end there. The latter transferred one officer and three enlisted personnel to the group. The success of the 97th BG jammers in reducing flak losses saw an expansion in the use of jammers to other BGs. Jammer maintenance was soon transferred from the 16th RS to personnel from Twelfth Air Force Service Command, trained by the 16th.

BOFFINS AT WAR

Although the daytime missions provided value to the Twelfth Air Force, the 16th RS was more comfortable flying its missions at night. Natural partners in nocturnal operations were the RAF Wellington squadrons operating in theatre. Starting in late October 1943, the 16th RS flew five missions with the RAF over a one-month period. The intention was to let the bombers "stimulate" the German defences while a *Ferret* collected the resulting radar activity.

Normally the *Ferrets* would arrive over the target area before the bombers, orbiting at 12,000ft (3,600m) until the last bomber had passed. The missions were mutually beneficial, the RAF gaining updated target-defence data and the 16th RS acquiring new and unique signals or radar tactics. This helped considerably as the

16th RS engineers had started to tinker with their equipment. Once settled in stone stables and farmhouses at Foch Field, the 16th RS engineers started to improve their electronic equipment based on feedback from missions. This technique was more time-efficient than acquiring equipment from the USA and helped the squadron stay abreast of evolving technology. The engineering section also took burnt-out SCR-587 receivers and turned them into frequency monitors to tune *Carpet* jammers carried by 97th BG bombers. The section's work was not just confined to single components — it also modified entire aircraft.

The three original *Ferrets* continued to soldier on, but were starting to become weary owing to heavy usage. Three months of long missions flown at low altitude was hard on the airframes, so the 16th RS solved the problem just like it addressed other equipment shortages — by modifying what was on hand. Three more Fortresses — B-17E serial 41-9016 and B-17Fs serials 42-30379 and 42-3358 (named *Thunder Head*) — were acquired in theatre and converted to *Ferret* configuration in October 1943. *Ferrets III* and *IV* departed for the USA in late November for repair and were struck from squadron records.

Meanwhile, the 16th received back from the UK B-17F serial 42-30437, which had been despatched a month before; it was an ex-97th BG aircraft that had flown jamming tests with the squadron in September. This aircraft sported a new black paint scheme and British ELINT equipment. Lack of



ABOVE Named *Thunder Head*, B-17F 42-3358, seen here in September 1944, was converted to *Ferret* configuration by the 16th RS in October 1943. Visible on the spine of the aircraft are two posts fitted with Yagi-array direction-finding antennas and an additional post antenna. Two months later *Thunder Head* returned home across the Atlantic.

aircraft, however, was not the limiter for 16th RS operations; it was equipment, and this was one of the reasons why '437 went to the UK for fitting out. Although all squadron aircraft were probably equipped with Group A equipment (racks, cabling and antennas) to be able to operate as a *Ferret*, the unit only had enough receivers and analysers for two or three aircraft at most. Equipment was not the only shortfall the squadron was facing. Radar Observer officers trained at Boca Raton were also in very short supply, so the 16th RS initiated a plan to train enlisted men as Radar Observers.

Reconnaissance flights were flown by the 16th RS from dusk until dawn, lasting up to 12hr at altitudes of 200–500ft (60–150m) in the mission area. These long and gruelling missions were often flown in zero visibility and took their toll on men and machines. Something needed to change to cut down on transit time from Tunisia to the target area. One alternative was forward-basing aircraft in Italy, a practice that started in late October 1943 with *Ferret III* flying two night missions over the Adriatic from Grottaglia airfield at Taranto in Italy before returning to Foch Field.

A week later *Ferret V* arrived at Grottaglia to fly two additional Adriatic missions, while at the end of November 41-9016 deployed to Brindisi on Italy's "heel" for four Adriatic missions. Overall, 30 per cent of the 16th's missions in October and 10 per cent in November involved forward basing. These missions highlighted the flight-time savings of such forward basing and set the stage for future 16th RS operations and eventual permanent changes. Tasking during this period, beyond the Adriatic missions, was split between the west coast of Italy and the French Mediterranean coast.

CAT (OR FERRET) AND MOUSE

The 16th RS was not above trying any tactic to elicit a response from the German radar operators, who were starting not to pay attention to single aircraft trawling off the coast. On the night of November 16, 1943, the 16th RS fielded three *Ferrets* to parade up and down the western coast of Italy from Rome to Nice, France, at 15min intervals; the tactic was tried again with two *Ferrets* flying off the French coast from Nice to

BELOW The various aircraft of the 16th RS at Foggia, Italy, in July 1944. The handwritten numbers correspond to the picture as follows: 1) B-17F 42-30437; 2) B-17F 42-3055 *Ferret V*; 3) B-17F 42-3358; 4) B-17F unit hack #412; 5) B-25D radar calibration aircraft #463. Not numbered but parked to the right of '437 is the unit's unidentified P-38G.





ABOVE Maintenance personnel of the 16th RS prepare one of the squadron's Ferrets for another mission at Foch Field in September 1943. Initially lacking much of the necessary basic equipment, the unit was forced to borrow tools, maintenance stands and other equipment from the 17th BG's Air Depot Group in order to maintain its aircraft.

the Spanish border. The Germans, undoubtedly aware and probably highly amused, did nothing out of the ordinary and the squadron decided it was not worth the effort to repeat.

Another experiment, the "J-Mission", involved two *Ferrets* in a co-operative sortie, with one at 500ft (150m) and the other at 1,000ft (300m). Each carried a *Mandrel* jammer tuned to known operating frequencies of *Freya* radars, with the two jammers covering the known frequency range of the radar. Intended to see how the Germans attempted to counter jamming, the two missions, flown on December 27, 1943, and January 8, 1944, again accomplished little more than what one *Ferret* could; the idea was dropped.

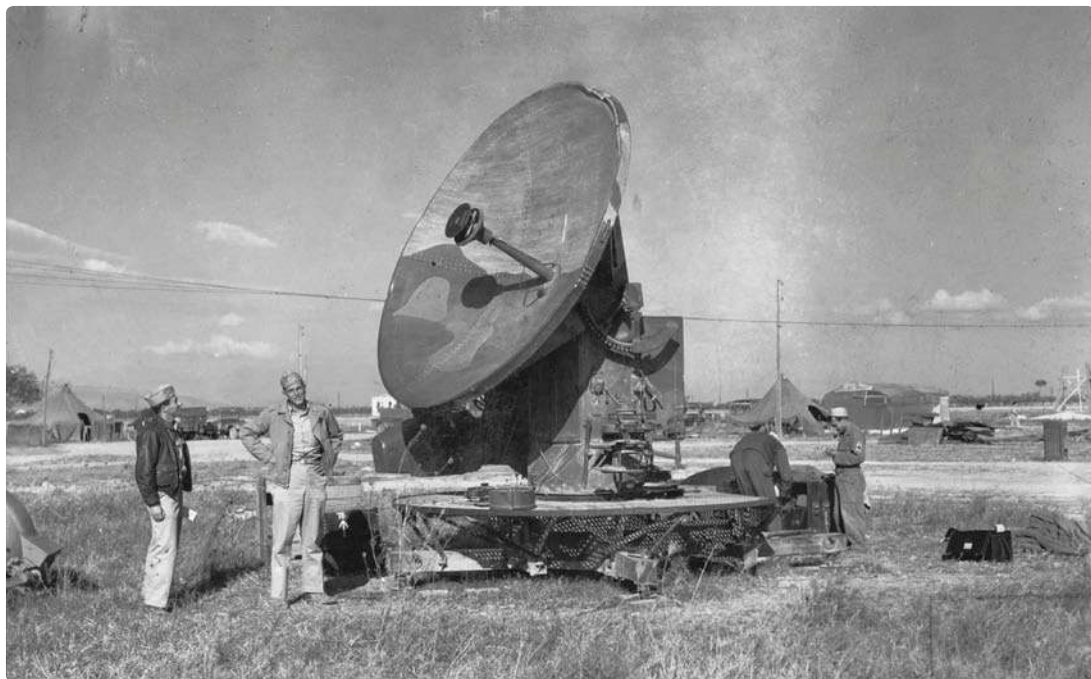
A total of 13 missions was flown by the 16th RS during December 1943, a decrease from the 21 flown in November, an operational peak the squadron would never surpass. The end of the year brought winter weather which, coupled with older equipment, had a negative effect on flight operations. As mentioned, on December 6, 1943, B-17E '016 was lost, flying into a hillside in northern Spain, killing all aboard. The SCR-521 navigation radar carried aboard should have prevented such an accident, but the subsequent accident report described this bit of kit as "war

weary" and needing replacement. Not only was the loss felt for the crew involved, but also for the electronic equipment carried aboard the aircraft. The unit noted that "most of our good equipment was on '016", and, after the loss, there was only enough equipment for one *Ferret*. Even the arrival of spares mid-month still only amounted to equipment for one more *Ferret*.

The hits kept coming, as the following month B-17F '379 was lost returning from Italy, crashing into the Mediterranean Sea. This again left the 16th RS with only enough equipment to outfit one aircraft. Even worse, '379 had the primary instructor for the enlisted Radar Observer course aboard, along with three students, further straining the unit.

Beyond '379's fateful mission, ten additional flights were flown in January 1944, including three missions from Brindisi against Adriatic targets and a support mission for an RAF night bombing raid on Klagenfurt in southern Austria. A combination of poor weather and loss of equipment brought 16th RS operations to a halt. Four missions were flown in February 1944 and eight in March as the unit struggled to get back into an operational tempo. The unpaved runway at Foch Field turned to mud, closing the airfield





ABOVE Lieutenant Carl Blumenschein, facing the camera, poses in front of his prized Würzburg gun-laying radar at Foggia in July 1944. Blumenschein was in charge of the squadron's tests with the captured German radar equipment, undertaken to observe the effects of chaff (aka Window) and jamming on the radar's target-tracking.

for operations for half of February. One *Ferret*, '437, struggled through the muck to Brindisi to fly three Adriatic missions, but all were cut short owing to poor weather. The only silver lining for this period was the much-awaited arrival of new electronic equipment from the USA.

A BELATED CHRISTMAS

On February 17 replacement personnel, radar receivers, direction-finding antennas and AN/ARN-1 radio altimeters arrived at Foch Field. It was a delayed, but very welcome, Christmas present for a squadron enduring a tough winter.

In March more gifts arrived; the squadron's "scrounger" supply system located a slightly used B-17F, known only as #412, and two new SCR-717C navigation radar sets still in their packing crates at a depot in Italy. The loot was quickly returned to Foch Field, where the radars were installed in *Thunder Head* and *Ferret V*, and #412 was stripped of armament and converted to an "admin ship" for future scrounging flights and other non-operational missions.

By means of a series of intensive flight tests, the 16th RS determined that the best way to combat the German *Freya* early-warning radars was through continued assault with ground-based jammers. Starting the previous December, the unit surveyed the island of Corsica for a location to emplace a system to "barrage-jam" the airwaves, and spent the next few months tinkering with five British "ground *Mandrels*". By April 1944 the system was in place and was turned over to the

US Army's 1st Signal Service Platoon (Special) — 1SSP — for operations.

The 16th RS was also on the hunt for German radars to bring back to Tunisia for testing with its jamming equipment. After a few bad leads, the unit finally located a *Würzburg* system at Taranto. By March 1, 1944, the radar was at Foch Field and by the end of the month it was operating again. Soon the 16th RS was running tests against it to determine optimum employment of "chaff" (*Window*) and *Carpet* jammers, as well as running missions to train jammer operators from the BGs.

Although Foch Field had become home to the 16th RS, the war had long since bypassed Algeria, and something needed to be done to shorten the unit's all-night missions. A survey of airfields in Italy revealed room at Foggia in southern Italy, and by mid-March the squadron had started to pack its bags. The last mission from Foch Field launched on March 25, 1944, and recovered at Foggia, with all subsequent missions flown from Italy. This change of venue shaved 4–5hr of transit time off each mission and was much appreciated by the aircrews.

The 16th RS used its aircraft to haul much of the unit's cargo during the move, with a ground echelon moving by land and sea at the end of April. As a result, only five missions were flown in April 1944, two of which accompanied RAF night raids. One, flown by B-17F '437 on the night of April 4–5, encountered heavy flak and night-fighters. The resulting "red-line" performance to depart the danger zone by Capt Harold Millen,



ABOVE B-17F 42-3055, the long-serving Ferret V, was the only remaining purpose-built Ferret serving with the 16th RS when the squadron concluded operations in November 1944. Apparently also given the name *The Pointer*, 42-3055 was disposed of in-theatre, as it was considered to be too weary to make the journey back to the USA.

due to leave combat the next month, resulted in three engines requiring replacement post-mission.

Despite Foggia offering easy access to the Adriatic, and about half of the missions flown in May and June covered this region, the German radar systems in north-western Italy and southern France still required surveying. Accordingly, *Thunder Head* was deployed forward to Borgo on Corsica, to fly co-operative missions with 1SSP, the operators of the ground-based radar jammers the squadron had built earlier in the year; 1SSP also operated ground-based direction-finding equipment, and *Thunder Head* flew eight missions in May collecting signals to allow a comparison between the airborne and ground-based yield.

The aircrew were not the only ones being kept busy with work; engineers and technicians of

the 16th RS remained occupied throughout the spring of 1944 with many new projects. The log-jam finally broke within the supply system and airborne jammers and receivers started to flow into theatre. Command of the strategic air war had switched to the US Fifteenth Air Force and it was decided to equip all BGs with jammers.

Accordingly, the 16th RS set up an ECM Observers' School in June 1944, running a two-week course for *Carpet* operators as well as training B-17 and B-24 radio operators in the use of APR-1 and APR-5 receivers to note details on radar signals. A North American B-25 of the 57th Bomb Wing (Medium) and a 320th BG Martin B-26 Marauder were fitted with SCR-587 receivers and an operator was sent to the 320th BG to train personnel on how to operate the equipment. The

BELOW B-17 42-3358 *Thunder Head* (left) at Foch Field in March 1944. Note the navigation radar in place of the ball turret and additional antennas on the spine of the fuselage. At the right of the picture is a B-25C/D named *Battle Bitch*, although it is unknown whether this is the aircraft the 16th RS acquired for radar-calibration sorties.



THE USAAF 16TH RECONNAISSANCE SQUADRON'S FERRETS

| Serial | Aircraft | Notes | Fate |
|----------|--------------|---|--|
| 42-29644 | B-17F-50-DL | Original CONUS* production; named <i>Ferret III</i> | Returned to the USA |
| 42-29881 | B-17F-75-BO | Original CONUS production; <i>Ferret IV</i> | Returned to the USA |
| 42-3055 | B-17F-20-DL | Original CONUS production; <i>Ferret V</i> , aka <i>The Pointer</i> ; mottled black camouflage | Disposed of in theatre |
| 42-3358 | B-17F-65-BO | Ex-jammer? Field modification; named <i>Thunder Head</i> | To depot, Hunter Field, Georgia, USA, 14.11.44 |
| 42-30379 | B-17F-100-BO | Ex-jammer? Field modification | Lost on mission, 26.1.44 |
| 41-9016 | B-17E | Ex-jammer? Field modification | Lost on mission, 6.12.43 |
| 42-30437 | B-17F-105-BO | Ex-97 BG; Field modification in UK; British equipment; black paint scheme? | To depot, Hunter Field, Georgia, USA, 14.11.44 |
| "#412" | B-17F | 16th RS "admin hack" | To depot, Hunter Field, Georgia, USA, 14.11.44 |
| "#463" | B-25D | Originally used for radar calibration; modified to <i>Ferret</i> configuration; no operational missions flown | Disposed of in theatre |
| Unknown | P-38G | Modified to receive radar receiver; never flew an operational mission | Disposed of in theatre? |

*CONUS — Continental USA

new equipment finally allowed all three *Ferrets* — 42-3055 (*Ferret V*), 42-30437 and 42-3358 (*Thunder Head*) — to be fitted with equipment at the same time. The squadron even acquired a B-25D and a Lockheed P-38G Lightning and fitted them with receivers, although no operational missions were flown with these and the equipment was removed after a couple months.

As the summer wore on, the 16th RS — again redesignated, from the 16th RS (B) to 16th RS (Heavy) Special, in July — prepared to support Operation *Dragoon*, the Allied invasion of southern France. Seven missions were flown in the lead-up to the assault on August 15, 1944, including flights to confirm the effectiveness of Allied air strikes on German radars, as well as B-17F '437 taking radarscope images to support Troop Carrier Command "Pathfinder" aircraft equipped with the same SCR-717B radar. On the day of the invasion *Ferret V* flew a long mission observing the German electronic reaction to the Allied onslaught.

PLOESTI: THE LAST MISSION

After *Dragoon* there was little left for the 16th RS to do. Allied advances in Italy and partisan activity in the Balkans negated much of the need for Adriatic missions. In addition, the Fifteenth Air Force BGs had become self-contained, with their own jammers and Radar Observers.

The 16th RS flew nine missions in September 1944 against targets in the northern Adriatic and north-west of Italy, marking the last operational sorties flown by the unit. Later that month, plans were issued for the 16th RS to deploy to another theatre; either the Pacific or China-Burma-India. Owing to the non-availability of equipment in those theatres, the unit would need to return to the USA to reform and re-equip. There was one last mission to do, however.

A Fifteenth Air Force conference on September 17, 1944, gave birth to a plan to fly to Ploesti in Rumania — newly liberated after signing an armistice the week before — to get spare parts for the 16th's *Würzburg* radar, currently sidelined at Foggia for want of replacement transmitter tubes, among other things. Radar Observers from the 16th RS and intelligence personnel would also inspect other radars to look for any new variants, as well as interview Rumanian radar operators. *Thunder Head* departed Bari in southern Italy for Ploesti on October 8 and returned on October 16 loaded with parts and information on German radars and nightfighters. It was a fine conclusion to the 16th RS's war against German radar.

The 16th RS's ground echelon departed Italy aboard the *SS Santa Paula* on November 3, 1944. The air echelon included admin aircraft #412 and *Ferrets* '437 and *Thunder Head* ('358). *Ferret V* ('055), the last remaining original, was considered too tired for the trip across the Atlantic and was unceremoniously disposed of in theatre, along with the squadron B-25D. The air echelon returned via the South Atlantic ferry route and up to Florida. After arriving at Palm Beach on November 14 the aircrew proceeded to the air depot at Hunter Field, Georgia, and turned in their aircraft.

After generous amounts of leave, the squadron re-formed at Buckley Field, Colorado, but was deactivated in April 1945. The Pacific War already had existing reconnaissance units and needed *Ferret* crews, so the combat-experienced Radar Observers, officer and enlisted, were transferred to March Field in California to set up a school to train new *Ferret* crews en route to the Pacific. A fitting reward for its hard duty the previous year, the 16th RS spent the last days of the war flying training flights and enjoying the sunny weather in Riverside, California.





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The Chipmunk is probably the most famous and well-known post-war piston-engined basic training aircraft after the Tiger Moth, for which it was designed as a replacement by de Havilland in Canada. It first flew on 22 May 1946 and entered operational service that same year. During the late 1940s and 1950s, the Chipmunk was procured in large numbers for air arms around the world, primarily the Royal Canadian Air Force (RCAF) and the Royal Air Force (RAF), who utilised it as their standard primary trainer aircraft. The type was also produced under licence by de Havilland in the United Kingdom, who would build the vast majority of Chipmunks, as well as by OGMA (Oficinas Gerais de Material Aeronáutico) in Portugal. The type served with the RAF right up until 1996 in the ab initial training role and many still fly today in civilian guise. This is another quality publication in the

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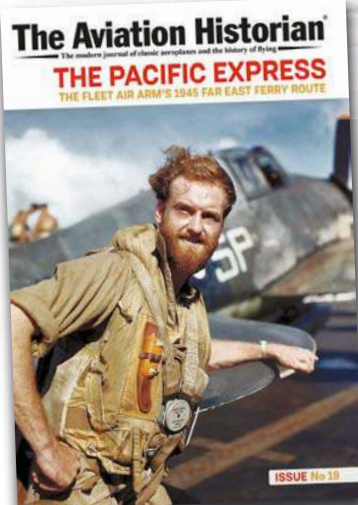
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Reflections on a TRAGEDY

In the caption to the splendid wartime colour photograph adorning the cover of *TAH19*, we misidentified Fleet Air Arm pilot Lt-Cdr Charles Lavender. After we put the record straight in *TAH29*, his son, **PETER LAVENDER**, got in touch to tell us about the post-war tragedy involving his father, who, having survived air combat in the Pacific and Korea, was killed flying a Supermarine Attacker in 1955

HISTORY, ARGUED Pulitzer Prize-winning historian David McCullough in 1984, is a guide to navigation in perilous times. It is who we are and why we are the way we are. I thought about McCullough's comments in relation to the summary of my father's life published in the *Air Correspondence* pages in *TAH29*. Who we are owes a lot to the family and friends who influence us and the many identities we carry in relation to the world we experience. History is also about trying to piece together different perspectives on events in order to throw more light on them.

A distinguished aviator

My father, Lt-Cdr Charles James Lavender DSC RN, was killed flying Supermarine Attacker FB.2 serial WP281 of No 1831 Sqn Royal Navy

Volunteer Reserve in November 1955, while based at Royal Naval Air Station Stretton (*HMS Blackcap*) near Warrington in Cheshire. The Attacker was one of the Fleet Air Arm's first jet fighters, and had been in regular front-line service since August 1951. Although 85 FB.2s were built, the FAA retired the type from front-line squadrons during 1954.

Charles Lavender, a chief flying instructor at the time, was a highly experienced pilot with combat experience in the Pacific during the Second World War and during the Korean conflict, and was a decorated and popular officer. Awarded the Distinguished Service Cross and promoted Lieutenant-Commander in September 1952, Lavender is described in Navy personnel records as "reliable", "competent", "friendly", with a "strong sense of humour" and "a good messmate who mixes easily".

ABOVE The Supermarine Attacker FB.2 was similar to the FB.1 but fitted with a more powerful Rolls-Royce Nene 102 engine and a modified cockpit canopy. This example, No 1831 Sqn's WZ283, wearing the fin code "ST" for RNAS Stretton, is seen here at the RNAS Anthorn At Home Day on July 19, 1956 — despite a ban on photography!

My father's record at the time of his death reports that he had accrued a total of 2,298 flying hours on single-engined aircraft, 95hr on twins and 46hr on jets, although the Board of Inquiry report issued after the crash states 14hr on jets, the latter perhaps being confused with the 14hr he had accrued on de Havilland Sea Vampire T.22s as a flying instructor between June and November 1955. My father was clearly a highly experienced and capable pilot, flying a thoroughly tried-and-trusted aircraft — so what had gone wrong?

The fateful day

The Board of Inquiry's official report states that at 1437hr on November 10, 1955, Charles Lavender took off at RNAS Stretton in WP281, coded "172/ST", on his first familiarisation flight in the type; as mentioned, he had flown jets before but not an Attacker FB.2. The weather was fine. The pilot was cleared for take-off from Runway 09, and, after a short run of 1,200yd, climbed steeply but slowly in a pronounced nose-up attitude. Meanwhile, a Percival Sea Prince coming in to land on Runway 15 was completing its downwind turn in line with the Attacker, at 500ft (150m). When both aircraft saw each other for the first time, the Attacker, at 400ft (120m), turned steeply to port. The Sea Prince turned sharply to starboard and dived to avoid a collision. The Attacker was observed to turn back again as if to pass over the Sea Prince, the former still slow and in a nose-up attitude. At this point the nose and a wing of the Attacker dipped. The aircraft stalled and, although

the pilot regained control, it was too late; the Attacker crashed to the ground, bouncing and skidding through two fields and a hedge for more than 150yd. The belly-mounted fuel tank burst into flames on impact. The crash tender crew succeeded in extinguishing the fire, after which they spent some time extricating the pilot, who had been killed instantly on impact.

The bald facts contained within the Board of Inquiry report are in stark contrast to some additional commentary from the Flag Officer Air (Home), which, more than 60 years later, brings a little colour to the story:

"I have an uneasy feeling that this accident might never have occurred if Air Traffic Control had exercised more positive control."

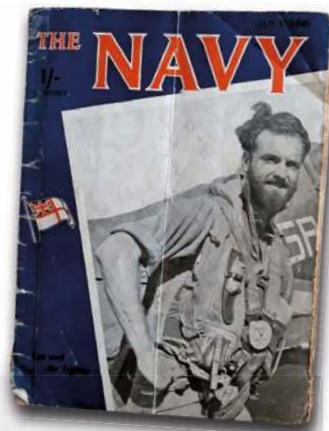
He points out that there were two unusual things happening at once at the time of the incident — a pilot taking off on his first flight in an unfamiliar type, and a pilot arriving at an unfamiliar base. The report continues:

"There are occasions in Service life when a show of *nous* serves to forestall serious trouble, although those not exhibiting it have stuck to the rules and cannot be indicted. This was such an occasion and, despite the fact that both were on the same [radio] channel, the pilot of the Sea Prince should have been warned about the Attacker and the pilot of the Attacker should have been warned or forbidden to take off until his path was clear."

RIGHT The July 1945 issue of *The Navy* magazine, with cover star Sub-Lt Charles Lavender. There is a small exhibition of Lt-Cdr Lavender's medals and the record of his service in Korea at the Fleet Air Arm Museum at Yeovilton.

BELOW The identity of the Sea Prince involved in the accident on November 10, 1955, is not known, but this example, WF132, photographed at RAF Odiham the previous month, has RNAS Stretton's "ST" code letters applied to the fin.

TOM SINGFIELD COLLECTION



AUTHORS COLLECTION





PHILIP JARRETT COLLECTION

ABOVE Built at South Marston in the same batch of 30 Attacker FB.2s as WP281, the aircraft in which the author's father was killed, WP289 taxis in with outer wing sections folded. The unit with which WP281 was on strength at the time of the accident, Stretton-based No 1831 Sqn, was the Royal Naval Volunteer Reserve's first jet squadron.

Nevertheless, the Board's formal report notes that the Attacker pilot was so low on speed as he climbed that his sharp manoeuvres used up what little reserves of energy the aircraft had left. The sudden appearance of each aircraft to the other must have been a shock. The report speculates about whether the Attacker may have stalled anyway, regardless of the presence of the Sea Prince. The Flag Officer also comments that "such an experienced pilot would soon have appreciated his attitude and would have pushed forward on the stick to gain speed". The Board exonerates the Sea Prince pilot, maintenance of the aircraft, pre-flight briefing, fire and rescue services and the weather. The Board's conclusion is unequivocal:

"We consider that the cause of the accident was loss of control by the Attacker pilot, and that this occurred because the pilot climbed away after T/O [take-off] at an attitude and airspeed which allowed him insufficient margin for manoeuvre. The violent evasive action taken to avoid the Sea Prince resulted in the aircraft stalling. That such an experienced pilot should allow himself to get into this predicament can only be explained by assuming that he concentrated on his cockpit and was not keeping a proper lookout."

The Board's recommendation is that although the primary cause of the accident was pilot error, where two runways are being used concurrently to meet the needs of both piston and jet aircraft, positive control of the circuit would increase the safety factor.

Extenuating circumstances?

But history is about more than one report. Missing from the Board's report is any mention of the mood of the pilot, who had been recommended for command of a front-line squadron but was disappointed at being passed over. He was making his first flight in the Attacker, which he was reluctant to fly, according to Capt E.M. Harvey at Stretton. It was also his 34th birthday. My sister's first birthday was less than a week away and I was only four myself.

That morning his flight had been postponed owing to a sports fixture and there was a slight delay because of white smoke issuing from the Attacker's engine. But, his brother later recalled, my father had left money behind the bar for drinks that evening and all appeared positive for this first flight, notwithstanding the pilot's reluctance to fly the Attacker. Perhaps he knew that nine other FB.2s had crashed in the last three years, some with fatalities.

History does not stop for death. In the Admiralty file are two letters from my father's Australian father-in-law, a Gallipoli survivor then living on remote Lord Howe Island in the Tasman Sea, concerned about his daughter's financial security as a result of the accident. He states in a letter dated November 14, 1955:

"I just got a cable from my daughter to say he was killed, and no doubt she is more or less brokenhearted . . . I am the only person she has living to assist her and not very well off."

The Admiralty's response, dated December 13 the same year, is official but warm, assuring my grandfather that his daughter would receive a payment of at least £200 and stating that the full report of the crash had not yet been received, but summarising it succinctly: "It seems that immediately after take-off from Stretton, Lt-Cdr Lavender took violent evasive action to avoid another aircraft, lost control of his own machine and crashed". The irony for the recipient was that the aircrew in the Sea Prince my father avoided were all Australian.

In retrospect the accident was a central point in many people's lives, changing the direction of everyone involved. My mother was angry with her husband for the rest of her life for taking the flight on his birthday, always believing that it was his fault, never seeing the Inquiry report, never visiting the grave, never wishing to discuss the accident. History makes us who we are and why. It doesn't necessarily explain things any more than a sentence in the letter from the Admiralty — but sometimes history is about a fuller story.



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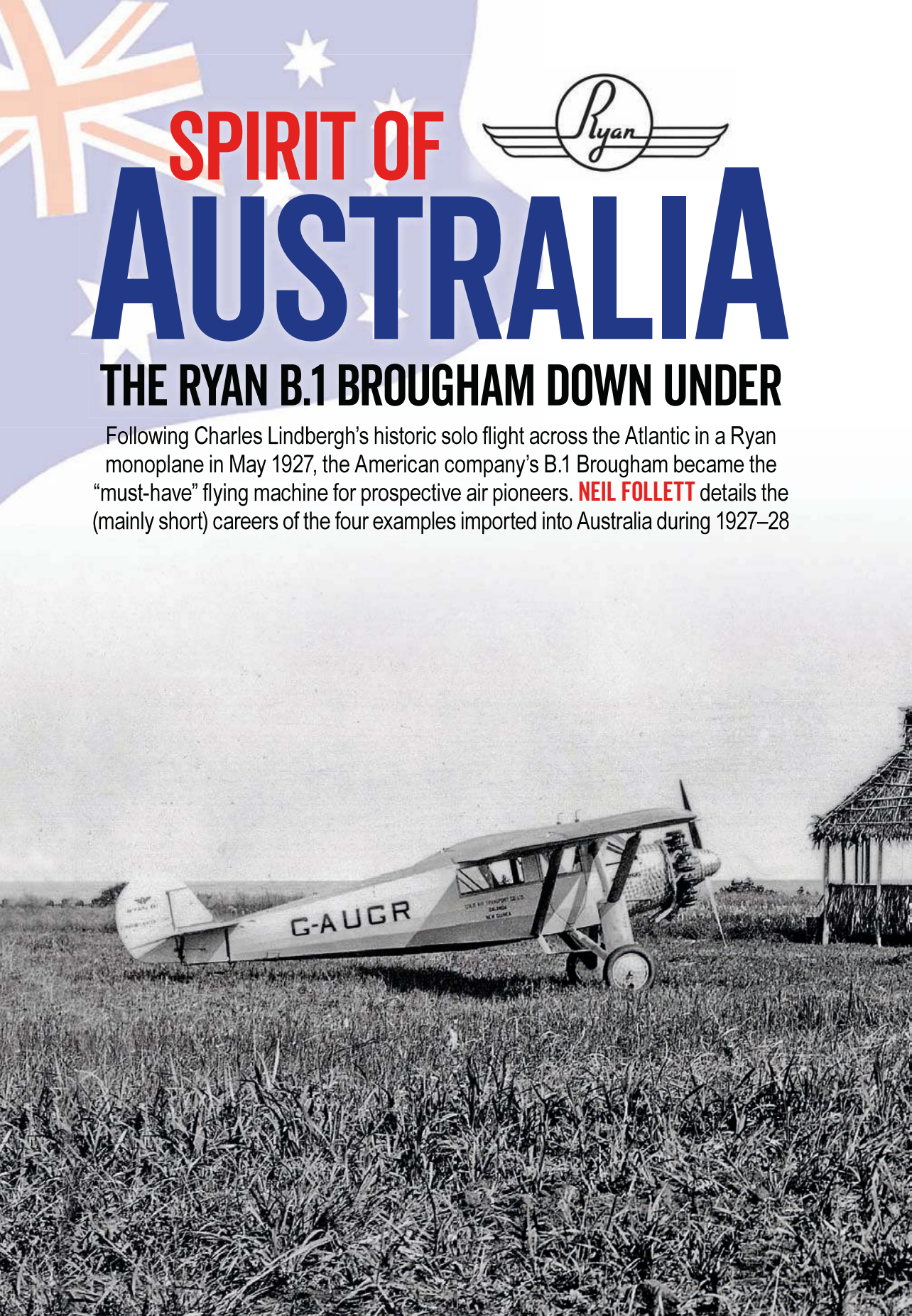
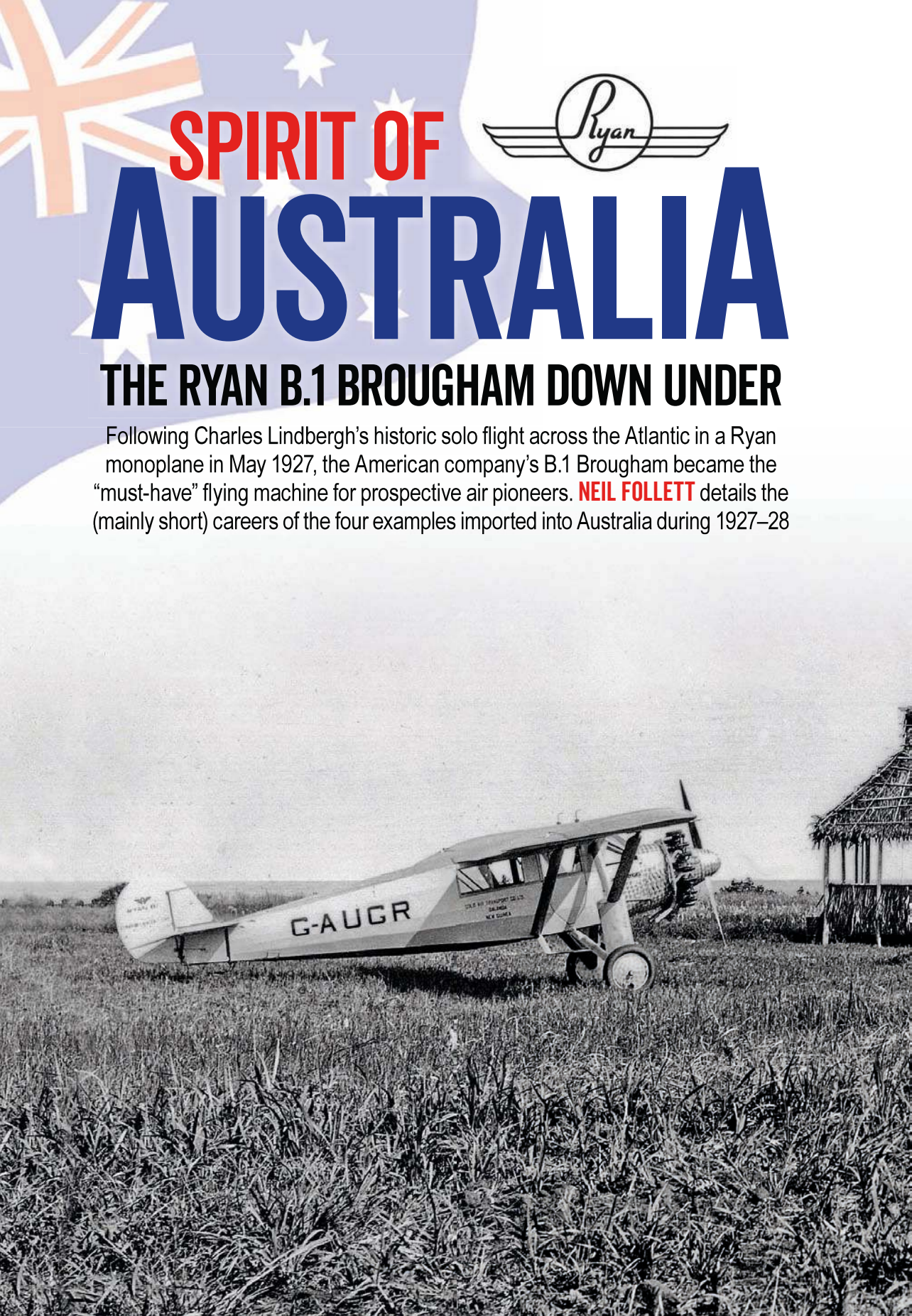
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SPiRiT OF **AUSTRALIA**

THE RYAN B.1 BROUGHAM DOWN UNDER

Following Charles Lindbergh's historic solo flight across the Atlantic in a Ryan monoplane in May 1927, the American company's B.1 Brougham became the "must-have" flying machine for prospective air pioneers. **NEIL FOLLETT** details the (mainly short) careers of the four examples imported into Australia during 1927–28

CLAUDE RYAN FORMED the Ryan Flying Company in San Diego, California, in 1922, conducting flying training and pleasure flights and converting surplus First World War aircraft for civil use. In the mid-1920s Ryan and his business partner, Benjamin Franklin “Frank” Mahoney, branched into aircraft design and manufacture, their first ventures being the Ryan M-1 and M-2 high-wing monoplane mailplanes, the prototype M-1 making its maiden flight in February 1926.

In 1927 their next design, the B.1 Brougham, a refinement of the M-2, was about to enter production when a disagreement between the partners saw Ryan leave the company. At this stage the company operated as Ryan Airlines Inc. On February 3, 1927, Frank Mahoney received a now-famous cable from one Charles Lindbergh asking if he could build an aeroplane to fly from New York to Paris. The B.1 design was accordingly modified and built as the NYP (New York—Paris) for Lindbergh’s successful

transatlantic flight that May, the first to be completed solo. Unsurprisingly, this historic flight attracted an immediate interest in the B.1, and some 150 examples were ultimately built.

In the Antipodes, many aviators had made plans since the early 1920s to be the first to fly the Tasman Sea between Australia and New Zealand. Most of these plans were impractical with the types of aircraft proposed, but because of Lindbergh’s remarkable achievement, the B.1 was deemed suitable and two were imported into Australia specifically for that purpose. Ultimately, a total of four examples of the Ryan B.1 Brougham appeared on the Australian civil register, the fates of which we detail here.

CROSSING THE TASMAN: 1

G-AUNZ, c/n 47 In 1925 New Zealander John Moncrieff announced his plan to fly across the Tasman Sea, but the Beardmore-Rohrbach Inverness flying-boat he originally intended to use was unsuitable and unavailable in any

Although the B.1 Brougham bore a recognisable family resemblance to Lindbergh’s famous Spirit of St Louis, early production examples shared surprisingly few common parts with their illustrious forebear — essentially the tail surfaces and some wing fittings; while later Broughams shared no commonality at all. Here B.1 G-AUGR awaits its next flight beside a state-of-the-art terminal in Papua New Guinea in the spring of 1928.

CIVIL AVIATION HISTORICAL SOCIETY





ABOVE Another view of G-AUGR in Papua New Guinea. The legend beneath the passenger window reads: “Gold Air Transport Co Ltd, Salamaua, New Guinea” and the Ryan’s ungrammatical-looking name, L’Oiseau de Tropiques, is visible on the cowling’s distinctive burnished swirls — applied both for æsthetic reasons and to mask imperfections!

case. The publicity Lindbergh received for his transatlantic flight resulted in Moncrieff and a fellow New Zealand Territorial Air Force pilot, George Hood, ordering a B.1. Accordingly the aircraft was shipped to Melbourne, Victoria, where it arrived on December 21, 1927.

The aircraft was assembled at the RAAF base at Point Cook and on December 24 Australia’s Contoller of Civil Aviation, Horace Brinsmead, advised Moncrieff that the registration G-AUNZ had been allocated to it. The registration was duly painted on the Ryan, as was the name *Aotearoa*, the Maori name for New Zealand. Interestingly, although the registration was allocated and painted on the aircraft, it was never officially registered.

After flight testing, the Ryan departed Point Cook on January 3, 1928, for RAAF Richmond in New South Wales (NSW), the intended starting point for the Tasman crossing. Owing to navigational difficulties, however, Moncrieff and Hood landed at Bong Bong, NSW, to determine their position. Following mechanical checks by RAAF personnel the aircraft departed Richmond at 0244hr on January 10. The last radio signals from the Ryan were received at 1452hr Sydney time, some 12hr 8min after departure. Nothing more was seen or heard of the aircraft or crew.

As usual when an aircraft disappears, many reports of sightings surface. The disappearance of *Aotearoa* was no exception. The Ryan’s destination in New Zealand was the Trentham Racecourse in Wellington, North Island, and many reports were made of seeing and hearing

the aircraft in that vicinity. Reports were also received from parts of the South Island. A New Zealand “spiritualist” claimed Hood and Moncrieff had landed in New Zealand and specified the location. A search, unsurprisingly, revealed nothing.

The most intriguing reports came from several people on Flinders Island in the Bass Strait, who reported the hum of an aircraft followed by a crash at 1030hr on January 10. A search proved fruitless. A report to the Tasmanian Chief Commissioner of Police stated: “Taking into consideration the course the Ryan monoplane was taking, its speed, weather conditions and the elapsed time since departure from Sydney, it is improbable that this report can have any relation to G-AUNZ”.

A false report of G-AUNZ’s arrival in New Zealand prompted a half-page advertisement in the *Sydney Morning Herald* of January 11 congratulating Hood and Moncrieff on their successful crossing of the Tasman Sea using Plume Motor Spirit and Mobiloil.

CROSSING THE TASMAN: 2

G-AUGR c/n unknown In 1927 New Zealand businessman Louis Selfert was looking at developing a trans-Tasman airmail service and had approached Percy “Skip” Moody to become involved in the venture. Accordingly Moody travelled to the USA and, after flying a Ryan B.1, placed an order for an example to be delivered to Sydney. However, the Director of Civil Aviation in Australia would not issue a Certificate of



ABOVE Ryan B.1 G-AUIX at RAAF Richmond, NSW, in September 1928. The title *Spirit of Australia* is just visible on the fuselage between the wing struts. The B.1 was similar in size to the *Spirit of St Louis*, with a span of 42ft 0in (12.8m) and a length of 27ft 9in (8.46m). The type was powered by a 220 h.p. nine-cylinder Wright J-5 Whirlwind.

Airworthiness for the Ryan and neither would he authorise a trans-Tasman flight using the type. Selfert withdrew from the venture, leaving Moody with the responsibility for the Ryan, although it was still owned by Selfert. Moody then proposed a trans-Tasman flight in the Ryan with O.H. Jolly as radio operator, but that plan was abandoned too, owing to the continued opposition of the Civil Aviation Branch (CAB).

The Ryan was eventually registered G-AUGR on March 12, 1928, by Mr Roland Nott on behalf of Airgold Ltd, and named *L'Oiseau de Tropiques* (Bird of the Tropics). It was transported to, and assembled in, Port Moresby, Papua New Guinea, in March 1928 and flown by Moody to Lae, its base for operations into Wau. It proved to be superior in payload and profitability to its biplane competitors.

On April 23, 1928, while making an over-water approach to Lae aerodrome, the Ryan suffered engine failure and ditched into the sea approximately 100yd from shore. After cutting his way out of the aircraft with a pen-knife, Moody, the pilot, escaped without injury. The Ryan had overturned on ditching but little damage was done. However, significant damage resulted from the subsequent salvage operation.

The aircraft was inspected by O.J. Howard, the Departmental Inspector, in August 1928; his report indicated that the fuel system was badly designed, in that, with low fuel, if the aircraft was flown nose-down, one wing down or in disturbed air, the fuel outlet pipe could become uncovered. He further reported that G-AUGR

was suffering from corrosion and rot owing to its immersion in salt water. He estimated the cost of repairs would be £550, and its scrap value £100.

Airgold advised the CAB on March 19, 1929, that the aircraft would not be reconditioned. As an aside, the first aerial crossing of the Tasman Sea was completed during September 10–11, 1928, by Charles Kingsford Smith and crew in Fokker F.VII/3m G-AUSU, *Southern Cross*.

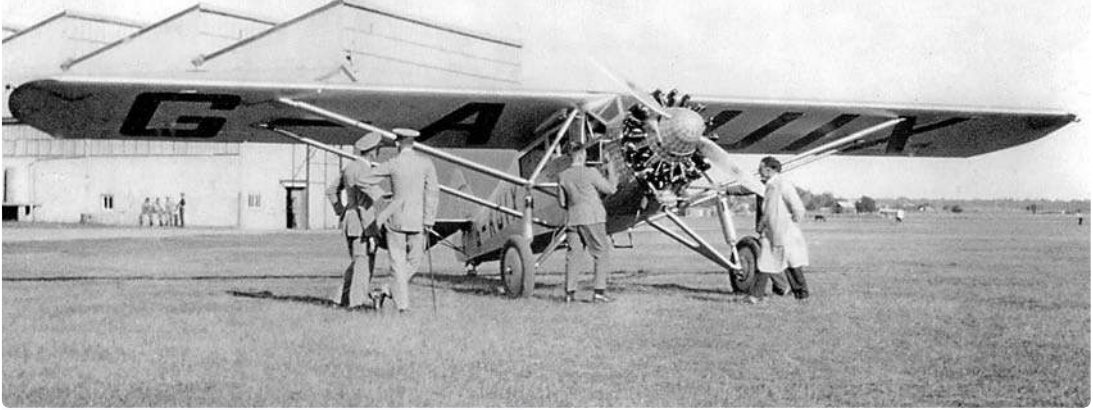
TO ENGLAND?

G-AUIX, VH-UIX c/n 148 The application for registration of this B.1, dated October 6, 1928, states the manufacturer as the Mahoney Aircraft Company of San Diego. Although registered to T.E. Rolfe, both he and Flt Lt Sidney J. Moir signed the application form. This machine was imported specifically for an attempt on an Australia—England flight to beat the England—Australia record then held by Bert Hinkler.

The flight was the brainchild of photographer Frank Hurley, gaining the financial support of Rolfe, who purchased the aircraft, which was registered G-AUIX and named *Spirit of Australia*. Hurley assembled a team, with Moir as pilot and Fg Off Harold C. Owen as relief pilot and mechanic, along with himself as navigator, radio operator and, naturally, photographer.

Spirit of Australia departed Richmond on October 30, 1928, for Wyndham in Western Australia, the nominated departure point for the flight to the UK. In the early hours of November 5, G-AUIX departed Wyndham for the team's first stop in Batavia on Java in the Dutch East

Another photograph of G-AUIX at RAAF Richmond before setting off for Wyndham, the starting point for the attempt on the Australia—England flight undertaken by Sidney Moir, Harold Owen and Frank Hurley in late 1928, during which the aircraft was written off in Greece.



VIA AUTHOR

SIDNEY JAMES MOIR was born in September 1896 in Paddington, Sydney. Enlisting in the Australian Army, Moir served overseas before transferring to the Australian Flying Corps as an observer and then as a pilot. Returning to Australia in June 1925, he served with the Citizen Air Force at Richmond, NSW. He continued to fly privately and was an honorary instructor with the NSW Aero Club, serving as President. He joined the RAAF in a training capacity during the Second World War, reaching the rank of Wing Commander.

HAROLD CLAYTON OWEN OBE was born in Warrnambool, Victoria, in June 1901. He joined the RAAF in 1924 and served as an engineer and pilot. He resigned his commission when he was refused leave to partake in the flight to England. Unable to rejoin the RAAF on his return, he joined the aviation staff of Shell. During the Second World War he served in the RAAF in an engineering capacity, reaching the rank of Group Captain.

Indies (now Jakarta in Indonesia). The usual traumas associated with record attempts at that time, including atrocious weather, unsuitable landing areas and lack of co-operation from officials en route, ruined any chance of setting the record that they were after.

After arriving in Greece, a take-off from Tatoi aerodrome near Athens went awry when the B.1 clipped a high bank of clay just after becoming airborne, causing the aircraft to overturn. Owen and Moir were uninjured; Hurley suffered slight head injuries, but the Ryan was damaged beyond repair. Moir and Owen continued on to England, determined to buy or hire an aircraft to return to Australia by air. Their plans became redundant when Vickers offered them the sole Vellore I, G-EBYX, for the journey, which they accepted. Powered by a single Armstrong Siddeley Jaguar engine, the Vellore left England on March 18, 1929. Engine problems dictated a

A splendid photograph of B.1 Brougham G-AUIZ City of Sydney, with the NSW Airways Ltd logo on the door, after joining the company in November 1928. This was the second Brougham to be used in an Australia—UK flight attempt; but it flew only as far as Thailand before suffering damage in a forced landing, which unfortunately put paid to the expedition.

VIA AUTHOR



Following its return from Thailand, VH-UIZ was sold by NSW Airways to another fledgling Australian airline, New England Airways, with which it was named City of Lismore, just visible on the port door. It apparently wore various colour schemes with the airline, this photograph showing dark sections applied to the fuselage, wing leading edge and wingtips.



forced landing at Mersa Matruh in Egypt, during which the aircraft was damaged. A new lower wing and undercarriage were required, and after manufacture in England the parts were shipped out and the Vellore repaired.

On April 28 the flight was resumed and Moir and Owen continued their journey through the Middle East and India down to South-east Asia, through some extremely challenging conditions. The final leg to Darwin was across the Timor Sea, and when they failed to arrive an extensive air search was initiated to locate them. The Vellore was located after about a week at Cape Don, 110 miles (180km) north-east of Darwin, where they had made an emergency landing with a failing engine in some trees near the lighthouse.

ANOTHER UK ATTEMPT

G-AUIZ, VH-UIZ, c/n 92 Ryan B.1 G-AUIZ was imported by David A.B. Smith and came on to the Australian civil register on October 10, 1928, to be named *City of Sydney*. Smith had established NSW Airways Ltd, to which the Ryan was transferred on November 19 that year for charter and pleasure-flying activities.

On March 12, 1930, Smith announced his plans to use the re-registered VH-UIZ (see panel at right) for an attempt on the Australia—England record. He engaged Walter H. “Wally” Shiers, who had won prominence as an engineer on the first flight from England to Australia with Ross and Keith Smith in 1919, to accompany him on the flight in the same capacity. They left Mascot in Sydney on March 24 bound for Wyndham, again the starting point for the record attempt. On March 29 they became lost in the Wyndham area and made a forced landing in the same area where Kingsford Smith and crew had become lost a year previously in what became known as the “Coffee Royal Affair”. Fortunately they were

IN JULY 1919 the International Commission for Air Navigation (ICAN) allocated civil aircraft registration prefixes to each member nation. British Commonwealth countries were allocated the letter “G” with the next one or two letters indicating the countries within the Commonwealth. England used “G-E”; New Zealand “G-NZ”; Canada “G-CA” and Australia “G-AU”. Under the Air Navigation Act of 1920, Australia accepted responsibility for the “registration, marking and airworthiness” of aircraft. However, aircraft operating in Australia continued to be registered against the British nationality mark until 1929. With the exception of G-AUAA (see below), “double-letter” marks were not allocated, for reasons unknown. The first registration in the Australian series, G-AUAA, was allocated to the Civil Aviation Branch’s new de Havilland D.H.37, registered on July 1, 1924. The CAB also reserved the block G-AUAA to G-AUAZ for its own use.

The International Radiotelegraph Convention in Washington DC in 1927 produced a revised table of nationality and registration markings for aircraft and other radio call signs. These recommendations were duly adopted by ICAN in June 1928. The Commonwealth of Australia was allocated the prefixes VH, VI, VJ, VK, VL and VM. Since the Dominions and Colonies did not have a vote at ICAN until about 1929, the allocation of “VH” was probably made arbitrarily.

From January 1929 Australian aircraft began displaying the registration prefix “VH-”. Aircraft previously registered G-A__ dropped the “G-A” prefix but retained the last three letters of their registration. Thus Ryan Brougham G-AUIZ, for example, became VH-UIZ. Owners were given a period of 12 months in which to effect the change. An exception was aircraft flying overseas, which had to change their markings before departing. Some owners stretched the year’s grace period to the limit, the last recorded changeover being made in early 1933. **Source:** Civil Aviation Historical Society (www.airwaysmuseum.com)



VIA AUTHOR

ABOVE In a much simpler overall silver colour scheme and bearing the New England Airways legend along the fuselage and its name, City of Lismore, beneath the painted-over lower cockpit window, VH-UIZ is prepared for another flight in the early 1930s.

RIGHT Wally Shiers (left) and David Smith beside VH-UIZ at Wyndham in April 1930. Note that the “engine-turned” or “perlée” effect seen here on the cowling is obscured by a layer of silver paint in the image of the aircraft seen above a few years later.



WYNDHAM HISTORICAL SOCIETY DX-7

found after only a few days and finally departed Wyndham on April 20, 1930.

By April 23 they had reached Singapore but the next day they ran out of fuel and made a forced landing at Petriu, near Bangkok in Siam (now Thailand). Unfortunately, the Ryan was damaged and the flight to England was abandoned. Smith and Shiers returned to Australia by ship after arranging for the air force in Siam to ship the aircraft back to Australia.

Smith was the son of the owner of the Australian Glass Manufacturing Company, and had learnt to fly at the age of 17. Tragically, he was only 20 when he was killed as a result of being thrown out of the cockpit of de Havilland D.H.71 Tiger Moth VH-UNV while flying at Mascot on September 17, 1930.

In October 1930 NSW Airways advised the CAB that VH-UIZ had been sold to the New England Motor Company, operating as New England Airways, with which it was renamed

City of Lismore and used on its service from Brisbane, Queensland, to Lismore, NSW.

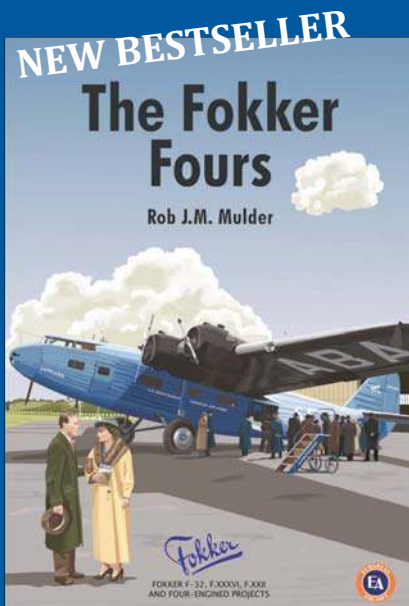
On December 29, 1935, Qantas-built de Havilland D.H.50 VH-UFW of Rockhampton Aerial Services made a forced landing on a beach between Bundaberg and Gladstone in Queensland to avoid a storm, becoming bogged in as a result. The crew of VH-UIZ saw the stranded aircraft and landed to offer assistance. The Ryan and crew returned the next day with equipment (a shovel) to dig out the D.H.50, but VH-UIZ itself became bogged in and was blown over by strong winds before being damaged further by the rising tide.

The Brougham was retrieved and sold in August 1936 to the Clancy brothers, who rebuilt it, restored it to the register on August 17, 1937, and sold it to Stephens Aviation at Wau in New Guinea in January 1938. It was used extensively in New Guinea until it was destroyed by enemy action on January 21, 1942.



The Fokker Fours

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In September 1929, Anthony Fokker presented his first four-engined aircraft in the United States of America: the Fokker F-32. It could carry up to 32 passengers and was at its time the largest and most luxurious aircraft in the world. Then, unexpectedly, came the Black Thursday at the New York stock exchange and the world changed... Fifteen aircraft were either completed or in various stages of assembly, before the production was stopped.

The idea of a four-engined aircraft caught on with KLM Royal Dutch Airlines. Albert Plesman, its managing director, committed to buy aircraft for the Amsterdam-Batavia service. The Fokker F. XXXVI and its scaled-down version, the F XXII, were no immediate success due to the introduction of the far more modern and faster Douglas DC-2. The only other customer for the F.XXII was the Swedish airline AB Aerotransport and later Scottish Aviation RAF, and Scottish Airlines.

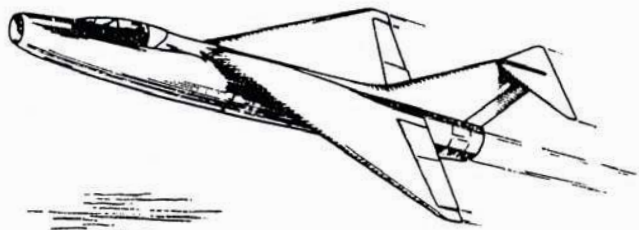
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STRUCK BY LIGHTNING

ARMSTRONG WHITWORTH'S AW.58 PROJECT

The English Electric P.1 (to become the remarkable Lightning) and world air speed record-shattering Fairey F.D.2 are iconic examples of British post-war supersonic development; far less well-known is Armstrong Whitworth's series of designs to the same requirement. Using contemporary brochures **TONY BUTTLER AMRAeS** tells the story of the AW.58

IN 1946 THE BRITISH Air Ministry (AM) cancelled the incomplete Miles M.52 turbojet-powered research aircraft, which had been intended to fly at supersonic speeds. Had it flown, the M.52 would have been the first British aircraft to break through the "sound barrier". In October 1947 the USA's rocket-powered Bell X-1 became the first machine to achieve supersonic speed anywhere in the world.

As a result, in 1948 the AM became interested once again in supersonic flight, and the Advanced Fighter Project Group (AFPG) was established at the Royal Aircraft Establishment (RAE) at Farnborough on March 1, 1948. Over the following summer, momentum began to build for a "hardware" project to go ahead. Indeed, the time was ripe for a new British supersonic project, and eventually a request was issued to selected aircraft manufacturers for design studies for a single-seat research aircraft, but also with an optional fighter capability.

Accordingly, a draft requirement was raised, which appears not to have been given an official designation. The quoted performance figures in this document included a maximum speed of 700kt or Mach 1.21 at an operating altitude of around 45,000ft (14,000m), with consideration



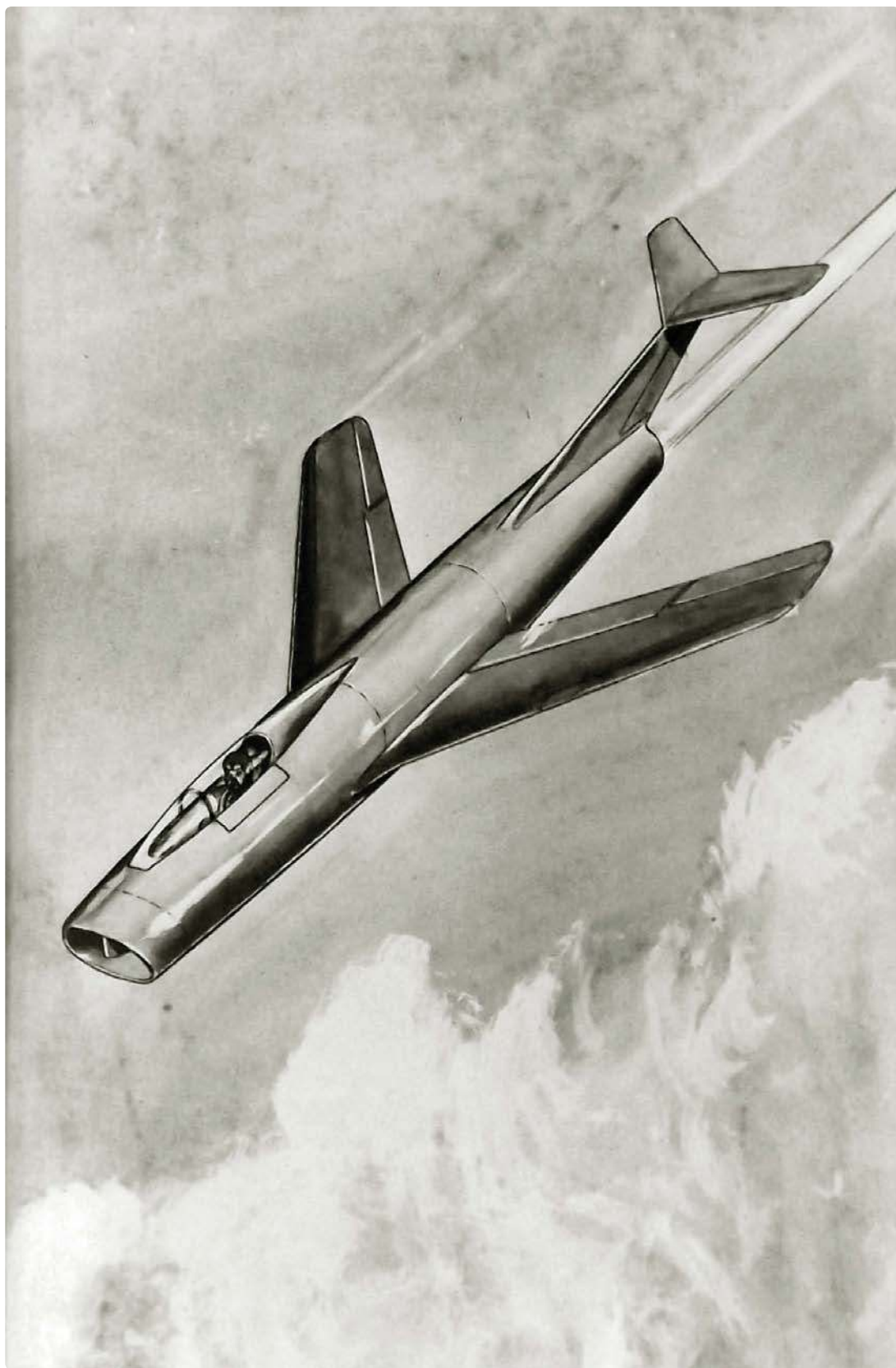
to be given to increasing the speed to Mach 1.4. The powerplant was to be one Rolls-Royce AJ.65 Avon turbojet, and the fighter version was to be armed with two 30mm cannon. Designs were submitted by Boulton Paul, Bristol, English Electric, Fairey, Gloster, Hawker Aircraft Ltd and Armstrong Whitworth Aircraft (AWA). English Electric's P.1 was ordered in prototype form and first flew in 1954, a development later entering service as the famous Lightning. A swept-wing design from Fairey was also looked on favourably, but this was eventually replaced by a delta-wing design which became the F.D.2, which also first flew in 1954 and later set a new world speed record.

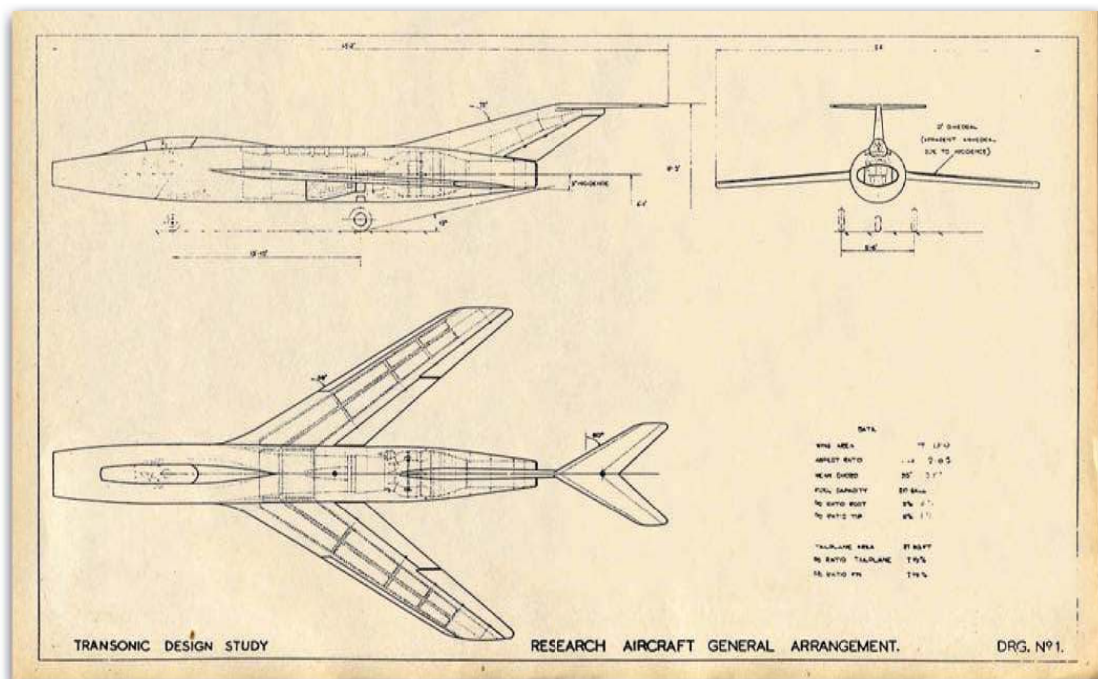
At one stage, however, there were also plans to build a third supersonic design, proposed by AWA. This was the AW.58, and the first project brochure is dated August 3, 1948.

THE ORIGINAL PROPOSAL

The basic aircraft described in AWA's brochure is a single-engined Avon-powered type with a wing area of 190ft² (17.67m²), incorporating 59° sweepback on the leading edge. It was believed that such an aircraft would reach Mach 1.1 in level flight at 56,000ft (17,000m) without reheated. In the brochure, the manufacturer regrets that it

TOP A sketch of the delta-winged Armstrong Siddeley Sapphire-engined AW.58 design from the January 1950 AWA brochure. **OPPOSITE PAGE** This anonymous brochure illustration depicts the original single-engined AW.58 design, in the classic diving (sometimes climbing) attitude for which AWA's PR department clearly had a penchant.





ABOVE The three-view drawing of the initial single-engined AW.58 concept from the August 1948 AWA brochure. A note applied to the head-on view explains that although it may look otherwise, there is "0° dihedral (apparent anhedral due to incidence)"; according to the side-view, wing incidence was 3°. The wheel track is 5ft 6in (1.68m).

was found to be impossible to design an aircraft which could reach the required Mach 1.2 with an Avon without reheat. However, consideration is given in an addendum to the possibility of attaining this objective with the use of two engines, of which more later.

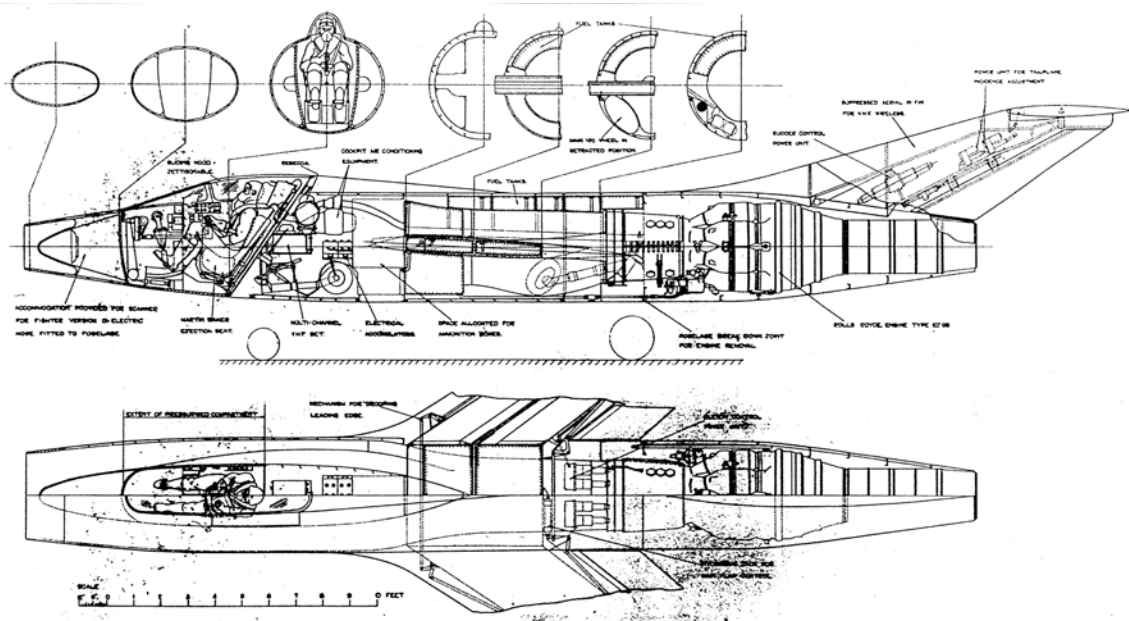
The basic AWA design was for a dedicated research aircraft with no armament or fighter equipment. The wing thickness/chord ratio is eight per cent throughout and the take-off weight is in the region of 6,500lb (2,950kg), increasing to about 11,300lb (5,100kg) with the addition of equipment. A corresponding increase in wing area in the latter case would go from 190ft² to 250ft² (17.7m² to 23.3m²), but in the manufacturer's opinion the larger wing area would greatly reduce the chances of exceeding Mach 1 in level flight with an unheated Avon. Hence the firm's decision to make the small-winged aircraft its primary design, but careful consideration was clearly given to making it convertible into an equipped fighter with the minimum of alteration. Indeed, the fuselage was designed with full provision for the installation of two 30mm cannon firing through an elliptical engine intake in the nose, and only the short centre-section of the fuselage would have to be replaced to provide increased spar centres for the larger wing likely to be required for the equipped aeroplane.

The latter did of course presuppose that a more powerful engine would be available, either a reheated Avon or an Armstrong Siddeley

Sapphire with or without reheat. Armstrong Whitworth believed that the need for a more powerful engine in the case of the equipped fighter was common to both single- and twin-engined versions. However, the use of a more powerful engine raised the question of fuel capacity. A new form of ribless construction already developed and tested by AWA had enabled the company to accommodate a considerable volume of fuel into the AW.58's wing without resorting to a large number of tanks or placing fuel in the fin. In all, 217gal (986lit) were to be carried in the small wing and body, sufficient to meet the endurance requirements with an Avon engine. With the larger wing a tank capacity of 330gal (1,500lit) was possible, which would be more than sufficient to meet the specification requirements with a reheated Avon. However, in order to keep the take-off weight down, AWA proposed in this case to carry 290gal (1,319lit), which included a reserve of 60gal (273lit).

ADVANCED SURFACES

A considerable design challenge was to make the AW.58 controllable at low speed. The firm's solution involved the use of drooped leading edges, fences on the upper wing surface, plain flaps, elevons and an all-moving tailplane without an elevator. The brochure emphasises that the drag estimates are the crux of the whole project and, at this time, great uncertainty existed in terms of wave drag; AWA had made



RAY WILLIAMS COLLECTION

ABOVE An illustration of the internal details, with section drawings, of the single-engined AW.58. Within the air intake and ahead of the cockpit is a cone marked as "accommodation provided for scanner for fighter version, dielectric nose fitted to fuselage". The engine marked on this drawing is a non-reheated Rolls-Royce AJ.65 Avon.

its drag estimates from the best data that its design team could find. In fact the reduction of wing wave drag with an increase in angle of sweepback in the transonic region had been considered to be of such importance that the high angle of sweepback at the leading edge, 59°, seemed most desirable.

The drooped leading edges on the outer wings were selected to help increase the maximum lift coefficient, while the leading-edge fences were situated at 50 per cent and 70 per cent of the span to prevent spanwise flow migration and improve tip-stall performance. Longitudinal control was obtained by using the elevons on the outer wing operating as elevators, along with an all-moving variable-incidence tailplane. The latter would give coarse changes of trim for landing and ensure that high-speed control in pitch was always retained when a trailing-edge surface might be reversing its normal effect. Positioned atop the highly swept fin, the tailplane would also be well clear of the wing wake.

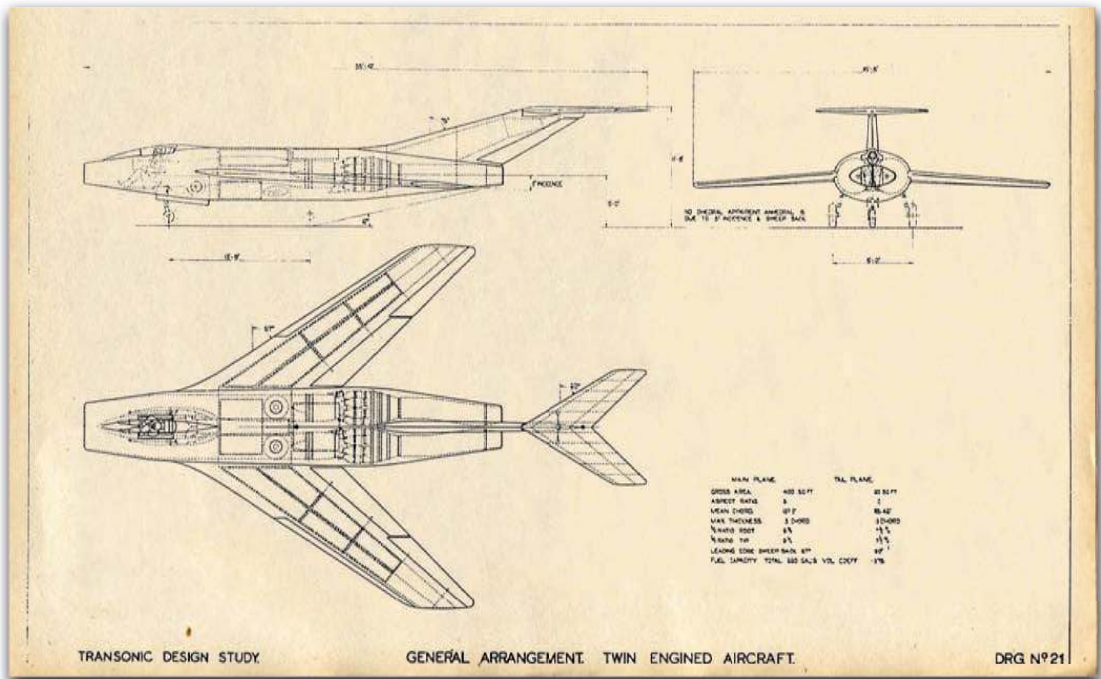
From the scant experience then available, it was likely that the effectiveness of the trailing-edge elevon controls would break down over a small range of Mach numbers near unity, and the separate trimming from the tailplane would then become all-important. The elevons were also to be used as ailerons and were expected to be quite effective during the climb and at the maximum flying speed at height.

Considerable attention was paid to the design of the air intakes, to reduce duct losses to a

minimum, by making the changes in section as gradual as possible and by preserving smooth walls. As noted, it was proposed that two 30mm cannon should be mounted, suitably faired, within the air intake. Provision was also made in the nose for the prospective fitting of a 15in (380mm)-diameter radar scanner and its associated equipment; however, these items had not been included in the AW.58's weight summary. It was also considered advisable to have the nose fairing for the scanner positioned behind the leading edge of the air intake. The fighter version would have a span of 27ft 6in (8.38m) and a length of 51ft 2in (15.60m).

The spar consisted of three webs, between which were carried distributed flanges of sandwich construction. The centre web carried concentrated booms which tapered from the body rib to zero at about 0.55 semi-span. The undercarriage comprised a tricycle arrangement with a single nosewheel on the centreline of the aircraft folding aft into a housing at the rear of the pilot's compartment. The single-tyre mainwheels retracted inwards into the annular space between the air intake and outer skin.

The brochure also devotes a couple of pages to the twin-engined version, which AWA considered for a period as it appeared to offer advantages in speed, and in reliability in the event of engine failure. Using two Avon engines with reheat, it was estimated that this version could reach Mach 1.4 at 36,000ft (11,000m). The general design of the wing was almost identical



ABOVE Looking rather bloated in comparison to the original single-engined design, AWA's Drawing No 21 shows the twin-engined AW.58 concept, with two Avons side by side, as described in an addendum in the August 1948 brochure. Again, the wing is noted as having "no dihedral; apparent anhedral is due to 3° incidence and sweepback".

to that of the single-engined aircraft except that the wing area would now be 400ft² (37.20m²) compared to 250ft² (23.25m²) on the smaller single-engined fighter version. The twin-engined AW.58 had a wing thickness/chord ratio of six per cent at the wing root and nine per cent at the tip; the leading-edge sweep angle was 57° and the internal fuel capacity was 375gal (1,705lit). The twin-engined version's frontal area, however, was inevitably more than twice that of the single-engined type, as the engines were placed side by side and had to be surrounded by a suitably faired shape. The greater fuselage length of the twin-engined aircraft also meant either a longer intake or a longer tailpipe would be necessary — or both — and no account was taken of any adverse effects that this might have on the engine performance. Because of these factors the twin-Avon version was essentially rejected by AWA itself before the brochure was submitted to the Ministry.

STARTING — AND STOPPING

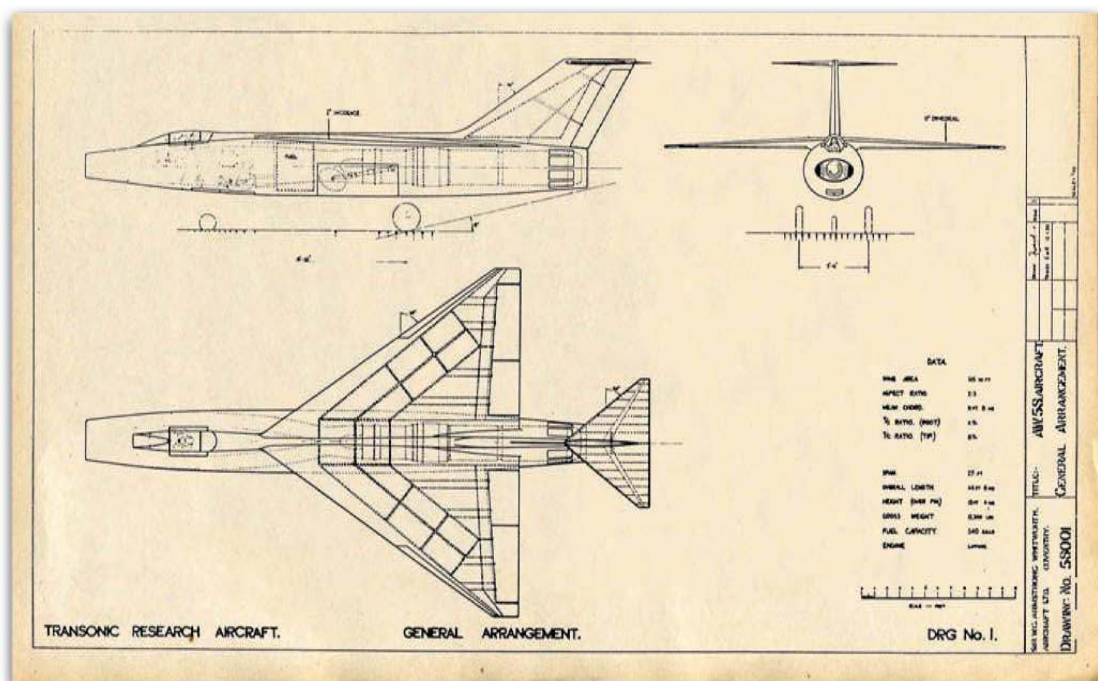
All of the submitted designs were reviewed at an AM meeting held on December 17, 1948, at which it was agreed that, although the AW.58 was considered to be the best submission, one English Electric P.1 should be ordered. Later, Fairey was approached with a view to building a single-engined research aircraft as well.

In late March 1949 it was made clear at the Ministry that the construction of prototypes should proceed as soon as possible, and an

agreement was ultimately reached to order two AW.58s and a pair of P.1s. The AW.58 "Transonic Research Aircraft" was covered by a new AM Specification, E.16/49, issued in September 1949 (the P.1 was covered by Specification F.23/49). There was no level-speed-limit requirement — quite simply the aircraft had to be capable of "exceeding sonic speed in level flight without using reheat". And despite its research category, it still had to have the facility to permit twin 30mm cannon and a 15in radar scanner to be installed.

A contract was approved for two AW.58s in April 1949, to be allocated serials WD466 and WD472, and the construction of an AW.58 mock-up commenced at the start of October. However, when the Advisory Design Conference was held on July 15, 1949, AWA had to report that the expected maximum level speed would now only be Mach 1.07 without reheat, and so the decision was taken to switch to an Armstrong Siddeley Sapphire engine with reheat.

With two other projects ongoing in the supersonic field from English Electric and Fairey, a meeting was called at RAE Farnborough on September 27, 1949, to choose between cancelling either the Fairey supersonic project or the AW.58, to save money. Since the twin-engined English Electric P.1 also had highly swept wings (60°), AWA was pressed to consider research into medium wing-sweep angles by reducing the AW.58's sweep to 50°. However, this proved impossible on the grounds of centre-



ABOVE In January 1950 AWA changed tack slightly and offered a brochure for another variation on the AW.58, this time a shoulder-mounted pure-delta-winged design with 2° incidence (and no dihedral), and a leading-edge sweep of 56°, fitted with a single Sapphire engine and a T-tail. Span was 27ft 0in (8.2m) and length was 44ft 8in (13.6m).

of-gravity and performance considerations.

Therefore, since the AW.58 was considered to be similar to the P.1, the case for continuing AWA's project was not strong, as it tended to duplicate the latter's research field. Furthermore, the AW.58's single-engine performance margin was small, and AWA had developed something of a reputation as being "slow moving". The Fairey delta proposal, however, was showing considerable promise, and so the decision was taken to cancel the AW.58 contract. After further discussions it was agreed that AWA should be approached to prepare proposals for a delta-winged design based on the Sapphire engine. Consequently, at this stage, work on the swept-wing AW.58 was only suspended "temporarily".

Armstrong Whitworth submitted a full

brochure for a delta-winged supersonic research aircraft on January 23, 1950. There was some debate about the position of the tailplane, but in the event the new updated AW.58 featured a T-tail, the design team stressing the need for a tailplane to ensure that the aircraft possessed adequate manoeuvrability if it was to be developed further into a fighter. The design was an altogether more solid-looking machine with a shoulder-mounted delta wing, the thickness/chord ratio of which was four per cent at the root and eight per cent at the tip. Internal fuel capacity was now 340gal (1,546lit). Armstrong Whitworth's development plans also included building a $\frac{3}{8}$ th-scale aerodynamic flying model which would be powered by a small Armstrong Siddeley Adder turbojet engine.

BELOW The second prototype English Electric P.1, WG763, makes a very low, and no doubt very noisy, pass some time after its first flight on July 18, 1955. Fitted with a pair of Aden cannon in the nose, WG763 also incorporated a bulbous belly fuel tank for the two thirsty (although non-reheated) Sapphire engines, mounted one atop the other.

TAH ARCHIVE



ARMSTRONG WHITWORTH AW.58 DATA

| | Single-engined version (August 1948) | Twin-engined version (August 1948) | Delta-winged version (January 1950) |
|-------------------------------------|---|---|---|
| Powerplant | 1 x 6,500lb-static thrust Rolls-Royce AJ.65 Avon turbojet engine | 2 x 6,500lb-static thrust Rolls-Royce AJ.65 Avon turbojet engines | 1 x Armstrong Siddeley Sapphire turbojet engine |
| Dimensions | | | |
| Span | 24ft 0in (7.32m) | 35ft 8in (10.87m) | 27ft 0in (8.23m) |
| Length | 45ft 2in (13.77m) | 55ft 0in (16.76m) | 44ft 8in (13.62m) |
| Wing area | 190ft ² (17.67m ²) | 400ft ² (37.20m ²) | 315ft ² (29.30m ²) |
| Weights | | | |
| Max take-off | 8,527lb (3,868kg) with 217 gal (986lit) fuel | 18,720lb (8,491kg) | 12,300lb (5,579kg) |
| Performance (estimated) | | | |
| Maximum level speed at sea level | 746 m.p.h. (1,200km/h) = Mach 0.98 with non-reheated Avon | — | — |
| at 36,000ft (11,000m) | 739 m.p.h. (1,190km/h) = Mach 1.12 non-reheated Avon; Mach 1.37 with reheated Avon; Mach 1.24 with Sapphire | Mach 1.4 | Mach 1.5 |
| Initial rate of climb | 17,000ft/min (5,200m/min) | — | — |
| Armament | 2 x 30mm cannon | | |



At the next AM meeting, held on March 21, 1950, this second iteration of the AW.58 was compared closely with Fairey's delta design studies, and it became clear that the Fairey project was lighter, faster and superior overall to AWA's aeroplane. The latter suffered severely from drag and, fitted with reheat, the best estimate for its maximum level speed was now only Mach 1.0, when the Fairey delta was expected to achieve Mach 1.25. To add to its woes, the AW.58's estimated rate of climb was substantially inferior and Fairey was also deemed to have a stronger design team. So on May 16, 1950, AWA was informed that the Fairey delta was now the preferred design and that the suspended AW.58 construction contract would now be cancelled.

Armstrong Whitworth was naturally disappointed with this outcome but, with hindsight, it seems unlikely that the AW.58 could have achieved the results and the records attained by English Electric's P.1 and Fairey's F.D.2. That said, had the AW.58 survived until 1954, when these aircraft both made their maiden flights, the Armstrong Whitworth machine might have looked quite different and offered an estimated performance much improved from its 1950 figures. We will, of course, never know.



ACKNOWLEDGMENTS *The author would like to thank Barry James at the Midland Air Museum, Ray Williams and the staff of The National Archives at Kew for their invaluable assistance with the preparation of this feature*

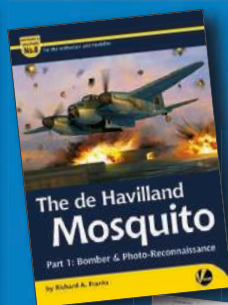
BELOW *The only occasion on which both Fairey F.D.2s, WG774 and WG777, appeared at the SBAC show at Farnborough together was 1956, as seen here, when the two were flown by test pilots Peter Twiss and Gordon Slade; the plan was for the pair to cross high above the airfield at Mach 1.25; the weather refused to co-operate, however.*

MIKE STROUD / TAH ARCHIVE



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ARMCHAIR AVIATION

We take a look at what's available for the aviation history enthusiast in the world of books and other literature, from hot-off-the-press publications to reissued classics

Britain and the Bomb: Technology, Culture and the Cold War

By W.J. Nuttall; Whittles Publishing, Caithness, Scotland, KW6 6EG (www.whittlespublishing.com); 6¼in x 9½in (170mm x 240mm); softback; 240 pages, illustrated; £18.99. ISBN 978-1-849953-89-4

DESPITE THE TITLE of this book, the bulk of the text concerns a subject close to many TAH readers' hearts — the BAC TSR.2 saga. The author does have a wider purpose here in analysing the relationship between technology — especially British nuclear weapons — and the UK's place in the world. However, seven of the 12 chapters are devoted to the ill-fated TSR.2 and its context in the evolution of British post-1945 military aerospace. The remainder considers the Polaris-Chevaline programme of the late 1960s and early 1970s.

Here lies the book's central problem — what is its exact theme? The author's commentary and analytic intent mainly focus on the nuclear question, but the emphasis on the TSR.2 seems at odds with this *leitmotif*. The aircraft was to have had a nuclear role, which the author explains in interesting detail, and this aspect of the specification certainly became more important after the collapse of Blue Streak and the shift to Polaris submarines. Important, that is, to the RAF, which was rapidly superseded as the delivery system of Britain's bomb.

As a history of the TSR.2, there are no new revelations here, although the avionics and electronics aspects are especially well considered. The sources are primarily well-trodden secondary materials, with Roland Beamont, Stephen Hastings and Derek Wood well to the fore. Strangely, the best of such sources, the chapter in Humphrey Wynn's *The RAF Nuclear Deterrent Forces* (HM Stationery Office, 1994), which had early access to the government record, is not cited. There are some diversions along the way; a discussion of the

Miles M.52's cancellation, the Lightning test programme and the Profumo scandal. I must admit to finding several of these irritating.

A more serious problem, to my mind, is placing so much significance on the TSR.2. It was certainly symbolic of Britain's military technological hubris in the late 1950s, as well as the Tory government's over-commitment of resources. It did have an emotional impact every bit as much as a commercial effect on the aerospace industry, certainly for the staff at the BAC factory at Warton. The aftermath of the TSR.2's cancellation and the ill-fated General Dynamics F-111 purchase is also well described, but the fundamental shift to international collaboration in military aerospace endeavours receives less significance than it deserves.

By the same token, the Blue Streak-Skybolt-Polaris story is given equally limited attention. For this reviewer, outside the history of the British bomb itself, this trio of delivery systems is very much the core historical episode linking Britain's experience of "technology, culture and the Cold War", and which I believe was a more central feature of the post-1945 political and strategic narrative than the story of the TSR.2.

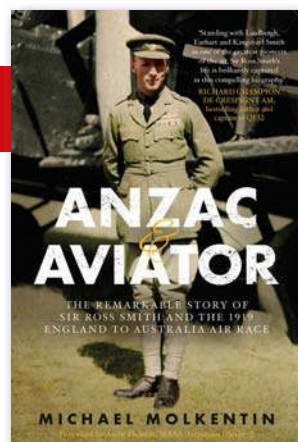
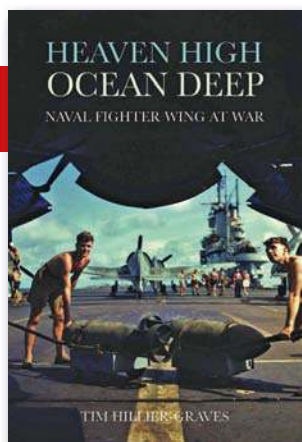
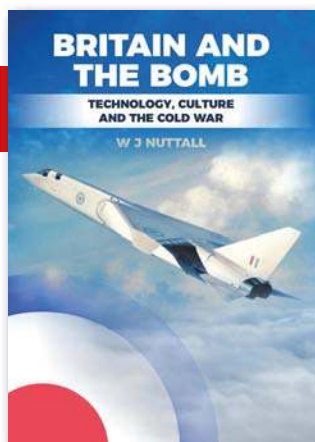
Overall, this is an interesting read, but perhaps attempts to take on too many themes for one, albeit complex and controversial, aircraft to carry.

PROFESSOR KEITH HAYWARD FRAeS

Heaven High, Ocean Deep: Naval Fighter Wing At War

By Tim Hillier-Graves; Casemate Publishers, 106–108 Cowley Road, Oxford OX4 1JE (www.casematepublishing.co.uk); 6in x 9¾in (152mm x 228mm); hardback; 224 pages, illustrated; £19.99. ISBN 978-1-612007-55-7

THIS HANDSOME HARDBACK charts the history of the 5th Naval Fighter Wing during 1944–45, in the Eastern/British Pacific Fleet



(BPF), operating the tough, dependable Grumman Hellcat. This is far more than just a history, however, being told via the personal stories of a number of the Wing's personnel, using interviews conducted by the author and contemporary material such as diaries and letters. As such, it gives a remarkably personal insight into the war in the Indian and Pacific Oceans, in a way that will soon not be possible to achieve. Indeed, the personal nature of the narrative extends to the author, whose motivation for writing the book stemmed from his father's Fleet Air Arm career, serving alongside several of the men whose stories are told within its pages. This is enhanced by the presence of many photographs from the aircrews' own collections, including lots of personal "snaps", although there are also plenty of familiar press photographs, including some well-known colour images. (Most of the photographs are simply printed in black and white on the running pages, but there is a small plate-section in the middle with better-reproduced images on glossy paper.)

The narrative begins with a rundown of the formation of the Wing and the training its crews underwent before heading east, interestingly showing the strain that even this could impart on men, some of whom had already been flying and fighting for years. The remainder of the book is devoted to the Wing's service aboard *HMS Indomitable*, apart from a brief spell when photo-reconnaissance aircraft and crews were detached to *HMS Formidable* at the very end of the war. We see the Wing go from "green" and not trusted to take part in early raids in the Indian Ocean, to battle-hardened and highly dependable, and finally to war-weary and overstretched. The book follows the Wing through raids against Sumatra, intended as much to prepare the BPF and prove their worth as for their actual military value, into the Pacific and finally against the Japanese home islands.

As an historian who generally writes with

the benefit of access to primary source material released years after the event, it can be tempting to be wise after the fact. It is fascinating and enlightening, therefore, to see the way *Heaven High, Ocean Deep* shows the developing Eastern war as it was viewed by those who were there — sometimes from their recollections, but often backed up by their own writings at the time. An example of this is the suspicion many of the aircrews had that Philip Vian, in command of the First Aircraft Carrier Squadron, was overly aggressive and demanded too much of a force that was still finding its feet. Particularly moving is the story of "Gammy" Godson, one of the Wing's senior officers, who was widely felt by his men to be struggling with the strain of eight months of operations and who died shortly before he would have been relieved. Similarly, the fate of Jack Haberfield, who survived being shot down only to be murdered after the Japanese surrender.

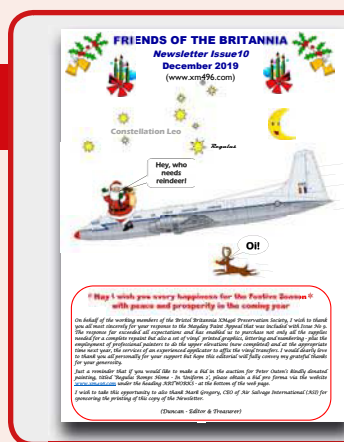
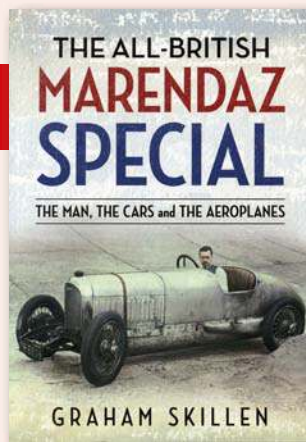
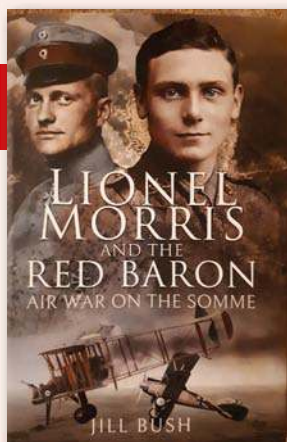
Overall, despite a few too many avoidable typos, *Heaven High, Ocean Deep* can be thoroughly recommended to anyone interested in the "Forgotten Fleet", and beautifully complements more heavyweight works such as David Hobbs's history of the BPF, with a pleasingly personal touch.

MATTHEW WILLIS

Anzac & Aviator: The Remarkable Story of Sir Ross Smith and the 1919 England to Australia Air Race

By Michael Molkentin; Allen & Unwin, 83 Alexander Street, Crows Nest, NSW 2065, Australia; 6in x 9in (152mm x 232mm); softback; 406 pages; illustrated; AUD\$32.99; ISBN 978-1-742379-19-7

AS HIS VICKERS Viking biplane stalled and spun into a stand of trees at Brooklands, an Empire aviator faced the final seconds of his life.



While his brother Keith watched in horror, Sir Ross Smith's aviation career ended in the place it had begun. Just a dozen years separated the Australian's first encounter with aircraft and his 1922 demise, on the verge of attempting an aerial circumnavigation of the planet.

In this accomplished and eminently readable biography, Michael Molkentin has again demonstrated why he ranks among Australia's leading aviation historians. Its title is perfect, encapsulating Ross Smith's service during 1914–18 as a member of the Australian & New Zealand Army Corps (ANZAC) and his airborne achievements with the Australian Flying Corps. As an observer and pilot in the Middle East, Smith reconnoitred, bombed and strafed Ottoman ground forces, while downing five German aircraft. Yet, notes Molkentin, "in none of the hundreds of pages of surviving letters and diary entries that Ross wrote does he use the term 'ace'". This quotation alone illustrates the extensive research, scrupulous observation and human insight that typifies *Anzac & Aviator*.

While Smith is rightly acclaimed for piloting the Vickers Vimy that first connected England with Australia by air, Molkentin argues that this feat did not occur in isolation. Having earned his reputation in Royal Aircraft Factory B.E.2s, B.E.12s and Bristol Fighters, Smith found his trajectory transformed by the arrival of a single Handley Page O/400 in Egypt in August 1918. Its unprecedented flight from Britain was led by the commander of the RAF's Palestine Brigade, Amyas "Biffy" Borton. Together, Smith and Borton completed a pioneering post-war flight to India, as a prelude to surveying a potential England–Australia air route. It was this practical, logistical and diplomatic experience, suggests Molkentin, that underscored Ross and Keith Smith's more celebrated achievement in winning the Great Air Race to their homeland in late 1919.

Soundly grounded in archival research

that spans Australian, British and German collections, this is a carefully crafted biography that balances pace with pleasing detail. Amply illustrated, carefully edited and well produced, it encapsulates the aviation aspirations of the British Empire through the life of one of its premature casualties.

Dr PETER HOBBS

Lionel Morris and the Red Baron — Air War on the Somme

By Jill Bush; Pen & Sword, 47 Church Street, Barnsley, South Yorkshire S70 2AS; 6¼in x 9¼in (160mm x 236mm); hardback; 224 pages; illustrated; £19.99. ISBN 978-1-526742-22-3

THERE HAVE BEEN several books published recently by non-specialist authors who have been inspired by a distant relative killed flying during the Great War. Sadly, I have not been able to be complimentary about all of them. But this book is of a much higher quality. Well-written and -edited, it has a decent index and bibliography, and is well-researched with copious references in the endnotes. A foreword by Trevor Henshaw, author of *The Sky Their Battlefield II*, is a good sign.

Lionel Morris was the first victim of the then-unknown Manfred von Richthofen — later to become the dreaded "Red Baron". Morris was 19 and an only child. He and his observer, 21-year-old Tom Rees, were shot down on September 17, 1916, in F.E.2b "7018" of No 11 Sqn RFC. The problem is that, like thousands of other young men who died under similar circumstances, there is very little information about Morris. Only two photographs of him exist.

When Jill Bush started researching her first cousin twice-removed, she had only family rumours to go on; however, she found that for a few months he had kept a diary, addressed

FRIENDS OF THE BRITANNIA

Bristol Britannia XM496 Preservation Society; members' biannual print newsletter; Editor Duncan Swift, e-mail dna@dunavon.com; Membership Sec is Jim Brown, 17 Burswin Rd, Carterton, Oxon OX18 1DZ; website www.xm496.com

THE SOLE GENUINE survivor of the RAF's Bristol Britannia fleet, C Mk 1 XM496 *Regulus* is preserved at Cotswold Airport, Kemble, Gloucestershire. It was the world's last flying Britannia, making its final voyage — from South Africa to Kemble — on October 12–14, 1997. Its many claims to fame include involvement in refugee evacuations from Cyprus and Bangladesh/Pakistan in the early-to-mid 1970s, and the transport of Tutankhamun's treasures for the British Museum exhibition in 1972. Friends of the Britannia, who pay a subscription of £10 a year, receive benefits (in addition, of course, to a warm glow for helping to preserve a fine and significant historic aircraft) including this lively newsletter/magazine. The latest edition features an engaging first-hand account by a former ATC cadet of a visit from the UK to Singapore and Malaya aboard XM496 in 1967; an update on recent efforts to repaint the airframe and refurbish the interior; and a report of a recent visit to the aircraft by a former World War Two Avro Lancaster navigator who went on to crew it during the 1970s. The A4-format eight-pager is illustrated throughout in well-reproduced full colour, and a membership subscription is a rewarding way in which to support the preservation efforts of a dedicated team. **MO**

to his mother. It is now in the RAF Museum, which allowed Bush to use extracts from it. Even the complete diary would not be enough to make a book, but, in conjunction with letters written by his CO and comrades after his death, it is possible to deduce that he was a quiet but dependable young man; reliable but probably not a born leader. That is about all we know — except that in von Richthofen's own account of the battle he pays Morris the compliment of believing that he was an experienced air fighter.

What the author has done is to give a general account of the history of any number of boys at Whitgift School, Croydon, who joined the school's Officer's Training Corps and enlisted soon after they were 18, before getting seconded to the RFC and training as a pilot. She includes a full examination of the efforts made to train enough pilots, and the inevitable shortcomings such a rushed programme engendered. Her discussion of the numbers of casualties in training is more balanced than some. She also includes an account of the air element of the Battle of the Somme, and No 11 Sqn in particular, during the period covered by Morris's diary. This is done competently with just a few oversimplifications.

The book has much of interest for readers of all levels of knowledge. Specialists may wonder if it covers only well-trodden ground, but they would have to be very well-read to find nothing new here. A newcomer to the subject will gain a good overview of the RFC in the first half of the war; a small problem is that the history stops on September 17, 1916, so they would not find out that the quality of pilot training improved considerably in 1917.

Jill Bush has done all that she possibly could to commemorate two young men who are now more than just names in a casualty list; and, especially for that reason, this is a book that deserves to be read.

ADRIAN ROBERTS

The All-British Marendaz Special: The Man, the Cars and the Aeroplanes

By Graham Skillen; Fonthill Media, Stroud House, Russell Street, Stroud House, Glos GL5 3AN; 6¼in x 9¼in (172mm x 228mm); softback; 192 pages, illustrated; £25. ISBN 978-1-781557-02-0

ONE HAS TO admire the author for tackling a mercurial character such as Capt Marcus Marendaz, especially as he had previously been the recipient of vicious criticism from his subject. Graham Skillen became the owner of a Marendaz car in the 1980s, and his fascination with both the cars and aeroplanes produced by Marendaz inspired the research that resulted in this book. While most of the content concerns the motor vehicles, there are chapters covering his service in the RFC from 1916, initially on Training Squadrons and then with No 35 Sqn, flying Armstrong Whitworth F.K.8s over the Western Front. His health then deteriorated, and he ended the war as a delivery pilot in the UK.

His undiminished fascination with flying led Marendaz to start dealing in private aircraft in the late 1920s, and with the demise of his automobile business he took up light aircraft design and construction in the mid-1930s, producing the Marendaz Mk III G-AFGG, which was apparently never flown, and the Marendaz Trainer G-AFZX at the outbreak of the Second World War (see *Lost & Found*, TAH28). He also established the Bedford School of Flying in 1938. Unfortunately, at the outbreak of war he was imprisoned under a detention order as a hostile alien, but was eventually exonerated. Post-war, he moved to South Africa and then returned to the UK, where he died in November 1988.

This is a well-researched and absorbing biography of a man who persisted in pursuing his engineering interests despite being beset by troubles of one sort or another.

PHILIP JARRETT



BOOKS IN BRIEF

A quick round-up of what else is currently available for the aviation history enthusiast

AIR WAR OVER THE PUTUMAYO

Amaru Tincopa & Santiago Rivas

Helion & Co; ISBN 978-1-912390-23-6; £16.95

REGULAR READERS OF these pages will know that *TAH* is a big fan of Helion's @War series, and this, the seventh *Latin America @ War*, is an excellent addition. Detailing the Colombian and Peruvian air operations over the Putumayo River, a politically important but remote stretch of the Amazonian rainforest, during 1932–33, the authors (both regular *TAH* contributors) have compiled a definitive account of this obscure, but absorbing, border conflict. With copious photographs, 26 colour profile artworks by Luca Canossa and useful maps, this is another Helion "must-have" for the library. **NS**



GLIDING & SOARING IN BRITAIN

Arthur W.J.G. Ord-Hume

Stenlake Publishing; ISBN 978-1-84033-835-5; £37

ALTHOUGH PRICEY for a sub-A4-format softback, this book — subtitled *The History of British Gliders and Sailplanes* — comprises a hefty 304 pages and includes a type-by-type directory, many of the entries in the latter featuring small but crisp three-views. Photographic illustrations are copious but variable; some are excellent, some poor (having been copied from other books and magazines). The volume provides a handy overall view of the engineless aspect of British aviation history — but a mix of error, omission, inconsistency and distortion means it should not be heavily relied upon as a reference source. **MO**

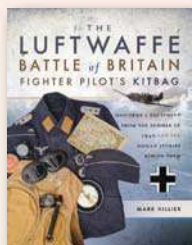


THE LUFTWAFFE BATTLE OF BRITAIN FIGHTER PILOT'S KITBAG

Mark Hillier

Frontline Books; ISBN 978-1-473849-95-2; £14.99

EVERYONE KNOWS that the Luftwaffe had the best gear, its pilots cutting quite a dash with their (often French) leather jackets, riding breeches and jackboots. The flying equipment available to the Messerschmitt Bf 109 or Bf 110 pilot by the summer of 1940 was state-of-the-art, experience gained in the Spanish Civil War and Poland having fostered great advances in all elements of the Luftwaffe fighter pilot's kitbag. With the help of private collectors of such *Ausrüstung*, Mark Hillier has put together an entertainingly insightful 137-page softback detailing German fighter pilots' flying helmets, oxygen masks, goggles (oh, the goggles!), flying clothing, lifesaving equipment, Service dress and other ephemera. It's brilliantly done — and completely engrossing. **NS**

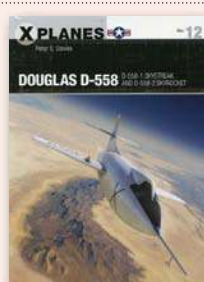


X-PLANES No 12: DOUGLAS D-558

Peter E. Davies

Osprey Publishing; ISBN 978-1-472836-21-2; £13.99

THERE'S MUCH TO like about Osprey's *X-Planes* series, which reaches its 12th volume with this lavishly illustrated treatise on the supersonic projects undertaken by the US Navy in collaboration with Douglas. As with the previous 11 in the series, a knowledgeable author, in this case Peter E. Davies, provides an authoritative commentary on an experimental type or series of types, aided by a good selection of well-reproduced photographs and dynamic digital artworks. The latter are provided by Adam Tooby in this 80-page softback tracing the development and careers of the six D-558-1 Skyrocket and D-558-2 Skyrocket aircraft built and flown during 1947–56. **NS**



THE HENSCHEL Hs 123 — A TECHNICAL GUIDE

Richard A. Franks

Valiant Wings Publishing; ISBN 978-1-912932-04-7; £13.95

NUMBER SEVEN in the publisher's *Airframe Detail* series, this slim 68-page A4 monograph on Germany's 1930s biplane divebomber is designed for modellers. It comprises a potted history of the type; lots of black-and-white photographs plus line illustrations from manuals; a camouflage-and-markings guide, featuring fine colour artworks; a kit-build, and a list of kits and accessories. Another useful and collectable reference package. **MO**

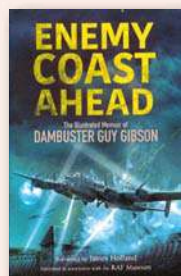


ENEMY COAST AHEAD

Guy Gibson

Greenhill Books; ISBN 978-1-784384-90-6; £9.99

SEPTEMBER 2019 saw the 75th anniversary of the death of Wg Cdr Guy Gibson. This new paperback edition of his memoir, written in 1944 while off operations in the wake of the famous Dams raid of 1943, includes a new foreword by James Holland (who offers some fascinating insight into Gibson's grim, loveless upbringing) and an invaluable 47 pages of fact-rich new endnotes (plus a fully updated roll of honour) by Dr Robert Owen, official historian of the 617 Sqn Association. All of this adds enormous value to Gibson's still remarkably readable classic. **NS**




Lost & Found

PHILIP JARRETT explores the lesser-known corners of aviation history, discovering little-known images and rediscovering long-lost details of aircraft, people and events. This time he is hunting for information regarding the ultimate fate of the obscure Miles M.64/L.R.5

THE SINGULARLY unsuccessful Miles L.R.5 or M.64 was designed to be the ideal aeroplane for a flying club or private owner, but it suffered from flow separation at the junction of the wing root with the fuselage, which caused a sharp stall at low speeds. Trials of the L.R.5 were abandoned in April 1947, and its 100 h.p. Blackburn Cirrus Minor engine was removed.

It has been written that the airframe was given to the Reading Sky Observers Club, which did nothing with it, and that it was scrapped in 1948.

However, a handwritten caption on the back of the upper picture on this page contradicts this, as it states: "Members of the British Ass. Aviation Clubs working on the Miles L.R.5 light 'plane, which they bought for £1".

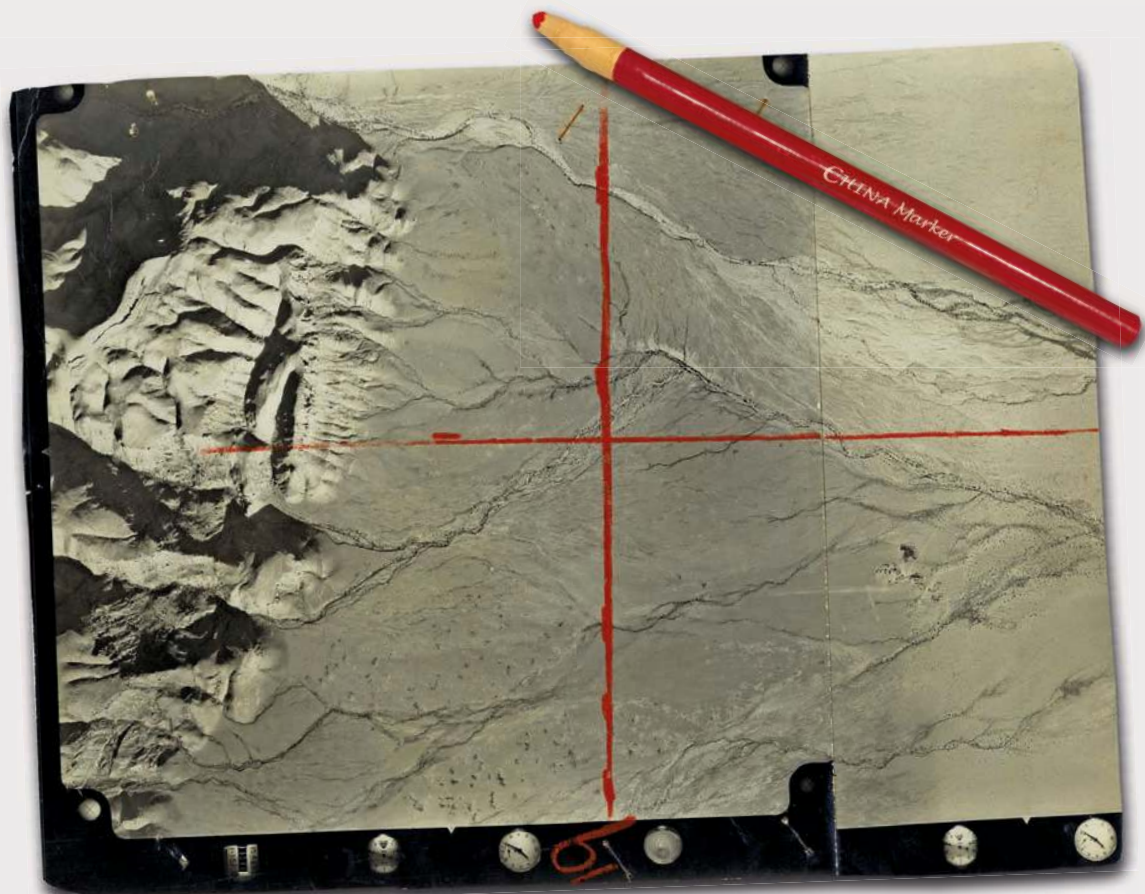
The picture also bears the stamp of the "B.A.A.C photo-section". Perhaps the Sky Observers Club was the Reading branch of the BAAC; but the group evidently had to make a token payment for the discarded L.R.5 airframe. Further enlightenment regarding its brief reprieve would be very welcome; correspondence to the Editor. 



LEFT The engineless airframe of the Miles L.R.5 gets some short-lived TLC from members of the British Association of Aviation Clubs in 1947. Designed and built by members of the development team at Miles's Liverpool Road premises in Reading (hence the "L.R." designation) in their spare time over the winter of 1944-45, the machine had a span of 36ft 0in (10.97m) and a length of 26ft 5in (8.05m).

BELOW The M.64/L.R.5 shortly after completion in early 1947, bearing the B Conditions identity U6 and the yellow encircled "P" denoting a prototype on the fuselage.





SAY CHEESE!

FLYING WITH HUNTING SURVEYS LTD, 1959-61

Part 2: Oil surveying in Somaliland, Libya, Ghana & Angola

In the spring of 1959 **ED WILD FRAeS** joined Hunting's survey division at Elstree, from where he was soon despatched on a DC-3 oil-survey expedition to Iran. In the second and final part of his series on flying for Hunting, he describes his next adventure with the company — covering the breadth of Africa — again with one of the company's trusty DC-3s



BACK IN THE UK, I learned that Elstree Flying Club — in the middle of its busy season — wished to make use of my services again. Within a few days, I was in the rear seat of one of the club's de Havilland Chipmunks, instructing once more. Hunting Aerosurveys had generously agreed to this arrangement on condition that it had first call on my services when work demanded. While awaiting recall, I flew some 70hr for the flying club. Earning me ten shillings an hour, it was not to be sniffed at. Further stints with Hunting saw me log 25hr of survey flying around the UK in Avro Anson G-AMBE and de Havilland Dragon Rapide G-AIYR.

In November 1959 I learned that Hunting required me for another DC-3 expedition, a high-altitude photographic survey of northern Italian Somaliland (now Somalia, then under United Nations trusteeship until July 1960), for the Italian oil company Agip. We would be living under canvas.

TO THE HORN OF AFRICA

The following month I boarded a scheduled flight to Nairobi, Kenya, to join Douglas DC-3 G-AMYW at Wilson Field, where it had been undergoing maintenance with East African Airways. Silver-haired Freddie Brown was the captain, a laid back, highly experienced ex-RAF pilot. Following a height check, we departed Nairobi on December 12, 1959, destination Mogadishu, capital of Italian Somaliland.

The city was a hot, humid maze of narrow streets and, to Freddie's horror, we had no hotel accommodation. Our local agent (obligatory in many parts of the world) was a smooth individual who had the right connections everywhere — in government, at the bazaar, at the best restaurants etc — but, strangely, not with local hotels. He eventually found us accommodation in the ex-Italian Air Force Sergeants' Mess on the airfield. It was dilapidated and dirty and there were no beds. Instead, we slept on straw palliasses, discovering too late that they were infested with lice. With gentian violet applied liberally, we spent the next few days looking like a troupe of travelling circus clowns.

Freddie was relaxed about my handling of the aircraft and gave me the honour of making our first flight into the oil-camp strip that we had yet to see. Our destination was Daarin, a desert airstrip located at 10° 39'N, 49°45'E, but about which we had little other information.



AUTHOR'S COLLECTION

ABOVE The author in the left-hand seat of Hunting Surveys DC-3 G-AMYW at Daarin in Italian Somaliland in December 1959. Having earned his UK fixed-wing flying licence in 1951, Ed accrued more than 17,000 hours — all accident-free — in command of an aircraft over the course of his long career in commercial aviation, from DC-3 to Boeing 737.

Established by Agip, the strip was to be our home for a while, so we were interested to see what lay in store there.

After droning over featureless sandy scrub for 4½hr, the view becoming bleaker with every mile, Daarin came into sight — a tiny encampment alongside a single runway visible in the sand. Agip had news for us: the 100-octane fuel ordered from Shell had not yet been delivered; although, so as not to delay the start of the operation, Shell had placed a modest supply on the beach at Aluula (aka Caluula) on the northern tip of the Horn of Africa.

There was no way of quickly getting the 44gal drums overland to Daarin. We would have to fly them in, Freddie announcing that we would be positioning to Aluula the following day. We departed early for the 50min flight, only to find nothing but sand where Aluula was supposed to be! After a short spell searching for a phantom runway, it became apparent that there were faint wheeltracks on the sand marking the line of the

OPPOSITE PAGE, TOP One of the survey photographs taken by the author's DC-3 from 26,000ft (7,900m) during his expedition to Italian Somaliland in December 1959. The camp and runway at Daarin are visible in the bottom right quadrant. **OPPOSITE PAGE, BOTTOM** DC-3 G-AMYW (c/n 33020) joined the Hunting fleet in August 1953.

Built as a C-47B-30-DK at the Douglas factory at Oklahoma, G-AMYW initially entered RAF service as KN497 with No 525 Sqn at Montreal in April 1945. After serving with Nos 238 and 10 Sqns in the UK, it received its civil registration and joined Silver City Airways in early April 1953, but was acquired by the Hunting organisation that August. It is seen here at Croydon in November 1954.



PETER KEATING © A FLYING HISTORY LTD

sand airstrip. Probably. Someone then spotted a cluster of drums to one side, which we guessed contained our fuel.

Freddie made a precautionary approach, and as we got closer confidence grew that we were in the right place. We landed on the sand and parked alongside the fuel dump. Surprisingly, several local tribesmen appeared, seemingly out of nowhere, taking a guarded interest in our activities. Smiles broke out when Freddie distributed local currency, enrolling them as temporary loading staff; the drums quickly rolled up the makeshift ramp we had brought with us.

UNWANTED BEAN FEAST

Back at Daarin, accommodation was not under canvas as threatened, but in small prefabricated aluminium huts. They were stiflingly hot by day, chillingly cold at night; we soon realised that tents would probably have been preferable. Agip provided catering; breakfast was a huge mug of black coffee and bread rolls. A large jar of salt tablets was left on the table to combat dehydration, as was the custom back then.

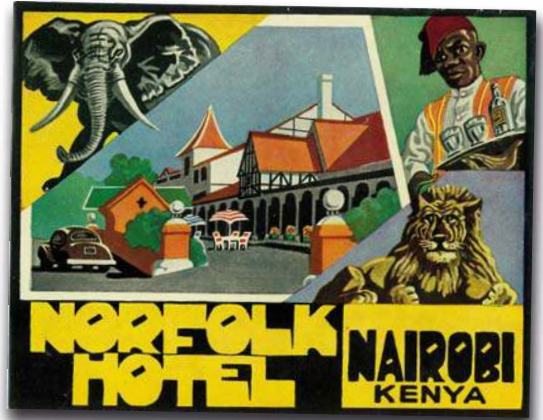
Because of the long sorties we intended to fly, we carried food with us on most flights, usually several loaves plus tins of bully beef or beans. On one occasion, our navigator, Maurice Gamester (**INSET, ABOVE RIGHT**), who had been appointed commissary, called to say "Grub's up". He appeared at my shoulder to hand me a huge doorstep of bread covered with baked beans. As I took it, Maurice slumped in a heap on the cockpit floor; he had removed his oxygen mask to deliver the food and was now suffering from hypoxia. I called for reinforcements; a



couple of crew members came forward and replaced his mask and he recovered quickly.

During the excitement, my food had fallen to the cockpit floor. The method of disposal seemed obvious: dump it overboard. Sliding back the large DC-3 cockpit window, I carefully gathered my lunch and thrust it out. Wrong! The cockpit became a blizzard of baked beans as the slipstream hurled them back inside. Beans were turning up in the cockpit for weeks afterwards, by then wearing furry green coats. The incident emphasised the need to monitor our oxygen supply at all times.

When not flying, the best times of day were mornings and the cooler evenings before the communal supper, when we regularly observed a meteorological phenomenon known as a katabatic wind. As temperatures fell in the evening, air at the highest part of the mountains cooled, becoming denser than the air below. The colder, heavier air eventually started to sink and slide down the steep mountainside. On hitting the plateau at the base of the mountain, the air mass, accelerated by gravity, would veer off across the desert at about 25 m.p.h. (40km/h), carrying large quantities of dust with it. The first indication for us, relaxing with our beers outside the tin huts, was a wall of sand some 200ft (60m) high moving quickly across the desert floor towards Daarin camp. On the first occasion this happened, one of the Agip staff issued a warning in Italian. His colleagues covered their beer mugs, indicating that we should do the same. We all retired to shelter until the dust storm had blown through. It cleared quite



AUTHOR'S COLLECTION x 2

LEFT A snap taken by a local street photographer during the group's enforced break in Malta in February 1960. The author recalls that "the camera was held together with string". Left to right: Maurice Gamester; the author; Arthur Devlin and Arthur Westaway. **ABOVE** A luggage label from the Norfolk Hotel in Nairobi, kept by the author as a memento.

quickly, and drinking could begin again.

Work was intensifying, and on December 18 we made a test flight to recheck recently installed Doppler navigator equipment. Two days later the high-altitude survey began in earnest. We had Christmas Day off and joined a group seeking a herd of deer that had been reported near the camp. A small convoy of rifle-toting "hunters" drove out that morning to find the deer only a few miles away. Driving alongside the now galloping herd, the hunters chose a couple of likely-looking animals and quickly dispatched them. The deer were bigger and heavier than was first realised, and everyone had a good Christmas lunch. Later, the Hunting group had a special treat; the wife of one crew member had packed him a tinned Christmas pudding, providing us each with a small portion to round off our festive feast.

Normality returned on Boxing Day with the familiar early morning start and long, slow climb. Daarin was just outside the area to be surveyed, so the only delay to beginning photography was the time taken to climb to

height, and a satisfactory reading on our Weston light meter. Maurice quickly had us on the first line and was making the routine "camera-on" calls. This pattern was repeated on an almost daily basis while the weather remained fine, and we made good progress with the survey.

Agip required a couple of lines to be reflowed as small patches of cloud had intruded on some of the prints. Finally, on February 1, 1960, we departed Daarin for Nairobi, routing once more via Mogadishu.

TO LIBYA

We stayed in Nairobi for seven days, once again at the Norfolk Hotel, a glorious, old-fashioned, low-rise place frequented by the white settlers, many still sporting guns in the bar, although the Mau-Mau troubles had been over for some time. While at Nairobi our aircraft underwent maintenance at Wilson Airport, where there was a substantial engineering facility.

A message was waiting; Freddie gave us news that we were being directed to another task. This time the destination was Libya to find oil

Used extensively for airborne mineral survey work, G-AMYW was fitted with various configurations of electromagnetic equipment, including "the bird" — a magnetometer on an 80ft (25m) cable stowed on the underside of the fuselage just aft of the trailing edge, as seen here.

PETER J. MARSON COLLECTION



Without the "bird", but with a magnetic anomaly detector (MAD) boom protruding from the tail (unfortunately cropped from this photograph!), G-AMYW taxis out for another sortie. Hunting Surveys Ltd was formed in late 1959 with the merging of Hunting Aerosurveys Ltd and Hunting Geophysics Ltd, the names of both of which are seen beneath the Hunting legend in this photograph, dating it as taken before the merger.



PETER J. MARSON COLLECTION

for King Idris; back then, the young Muammar Gaddafi was a mere trainee army officer. Agip once again had the contract and required Hunting to survey a large area of desert south of Benghazi. This time it was to be a low-altitude affair using a magnetometer — known as “the bird” — towed behind the aircraft on about 80ft (25m) of cable. The bird was stowed beneath the fuselage until required and then winched out by hand from a station in the cabin. The penalty for forgetting to rewind it before landing was a large bar bill.

On February 7, 1960, we left for Benghazi, quickly renamed “Benghastly” by Maurice. Our route took us from Nairobi to Juba, Khartoum, Wadi Halfa (all in Sudan) and on to Benghazi’s Benina Airport. On arrival Freddie was kept busy with issues relating to our right to be in Libya. After two weeks spent kicking our heels, we were ordered to leave because “a permit may only be obtained when applying from outside Libya”. Accordingly, we departed on February 21 for Malta, from where Freddie planned to apply for the required permit. By the 27th we had the necessary document and set off once more for Benghazi.

We were soon back into the swing of survey operations again. At 300 nautical miles (550km) minimum, photo lines were long. Undertaken at approximately 1,500ft (450m) above ground level (AGL), they were also tiring to fly because of turbulence. Taking turns with camera duties occupied both pilots for much of the long flying days, permitted by our long-range fuel tank.

By now, my flying hours were building up, many sorties showing airborne times of nearly 9hr. The terrain over which we flew

was beautiful but monotonous, the dunes having been windblown into incredible shapes, resembling a giant ocean seascape. Further north we saw evidence of wartime action in places — burned and broken vehicles half-buried, littering the desert floor.

BAD VIBRATIONS

With the survey well advanced, we departed Benghazi on March 23 to continue our task. After a couple of hours Freddie took over camera duties; I strapped in for a bumpy ride. We had just turned at the southern end of our run when I thought I detected a faint, unusual shudder run through the aircraft. Scanning the instruments, I detected nothing amiss; both engines continued to run smoothly with no worrying indications. We continued northward over the never-ending sea of sand.

A little while later, the vibration began again, this time more urgently and more intense. I called Freddie on the intercom and asked him to take a look, as I was becoming concerned. By the time he appeared all vibration had ceased and both engines were operating normally. Just as I was feeling sheepish for troubling him unnecessarily they started again, only this time with more intensity and with rapid fluctuations of the propeller r.p.m. on the starboard engine.

“Feathering No 2” said Freddie urgently, reaching up to the eyebrow panel and punching the large red feathering button. The engine shuddered to a stop, propeller blades now presenting minimum drag to the airflow. Freddie ran through the engine-failure drill. Speed was bleeding back from our cruising figure as the aircraft slowed owing to the reduced thrust.



I told Freddie that we were still gradually descending; power was increased on the live engine. The maximum allowable was 2,550 r.p.m. with 43in of boost, this power setting limited to 1hr of operation.

Meanwhile, the crew at the rear of the aircraft had their own problems. The magnetometer, capable of being jettisoned in an emergency, showed no sign of wanting to be separated from the mothership. Eventually, by combined effort, the umbilical connection was severed using the ship's axe. In the meantime, Maurice had given me a course to steer for Benghazi and an estimated time of arrival. Charlie, our radio operator, had put out a Mayday call at Freddie's request. The VHF radio was of little use this far from Benghazi; there was, in any case, little it could do to help. Charlie therefore used HF with its much greater range, me listening in to his transmissions. After a short delay, we got a response from an RAF station on Cyprus. Within a very short time two English Electric Canberras were getting airborne to join us. Also, an RAF search-and-rescue Handley Page Hastings would soon be departing with a paramedic team aboard. Our spirits were lifted.

But there was yet another cause for concern. The aircraft was now down to 1,200ft (360m); flying required a light touch if we were not to lose more height. During this time I had been in the left-hand seat, with Freddie naturally wanting to take my place for the landing. Fortunately, as the fuel burned off, together with the drag reduction resulting from cutting the bird free, the aircraft was now maintaining height. To get both pilots back in their rightful positions, Freddie decided that Charlie, who

ABOVE G-AMYW fitted with the full complement of electromagnetic equipment, including the "bird", MAD boom and "Meccano set" attached to the fuselage. The author recalls the latter: "It had a distinct 'whistling' airflow. Some said it could be made to produce a tune by varying the aircraft's speed. We often got comments from air traffic control when taxiing — 'did you make it yourself?' etc". PETER J. MARSON COLLECTION

had done some light aircraft flying in the past, should climb into the right-hand seat and take over. When he was settled and comfortable with the handling, I would move out of the left seat and allow Freddie to climb in. Then I would take Charlie's place. The choreography worked, our changeover taking place without incident.

By the time I was back in my seat we were in VHF contact with the Canberra leader, now in sight. The three aircraft flew in loose formation, both Canberras shutting down an engine to conserve fuel. Noses in the air, they were to stay with us as long as possible to mark our position in the event of a forced landing. At last the field at Benghazi came into sight. A drama-free landing ensued; the Canberras relit their engines and disappeared to the north-east, the heartfelt thanks of this DC-3 crew following them.

Our flying time on this sortie was just under 6hr. The incident left a strong impression on me, especially the professional way in which Freddie and the crew dealt with the problems, precise navigation on the part of Maurice Gamester and the heroic efforts by the crew at the back in dealing with the magnetometer hang-up. In contrast, I felt my contribution had been somewhat lightweight.

It was April 3, 1960, before a replacement engine saw us back in business and able to

“An experimental flight was undertaken in company with one of two Percival Princes then operating in the area with Hunting’s associate French company, SAPA Paris. This entailed the Prince navigating and the DC-3 forming at a fixed distance behind . . .”



ABOVE *Percival Prince F-BJAI (nearest the camera, formerly G-AMLW) and Survey Prince F-BJAJ (formerly G-ALRY) of Hunting’s French associate company Société Anonyme de Prospection Aeroportée (SAPA), both of which were operating in West Africa in September 1960. Note the Survey Prince’s extended glazed nose section.*

complete the Libyan survey contract. The return flight, Benghazi—Malta—Nice—Southend, added an uneventful 12hr to my logbook. I didn’t know it at the time, but three weeks later I would be leaving the UK once again. Perhaps the next expedition would be a little less exciting.

HOME AND AWAY

In the brief interval between returning from Libya and wherever the next overseas assignment might take me, I was back at Elstree once again, sharing my time between Hunting Surveys (flying mapping surveys of the southern UK in Rapide G-AIYR) and the Elstree Flying Club, where I continued to instruct on a part-time basis. The sojourn was not to last long.

On June 4, 1960, a call from Hunting would see me heading for West Africa, reunited with G-AMYW. For this trip, Geoff Earlam was Captain, with Maurice Gamester once again the navigator. Our task was a gold survey in Ghana, to be carried out at low altitude, again using “the bird”. On June 15, after a series of pre-departure flight checks from Southend, we left for Accra, routing via Algiers and Tamanrasset in Algeria and Kano in Nigeria. Flight time was 21hr.

On June 20, while carrying out a final equipment check, we were 15min out of Accra when one of the dustbin-shaped Doppler installations behind the cockpit area became hot. With the cover removed, there was a worrying amount of flame and smoke. Geoff promptly reversed course back to Accra and I put out a Mayday call. Thanks to some brave individuals,

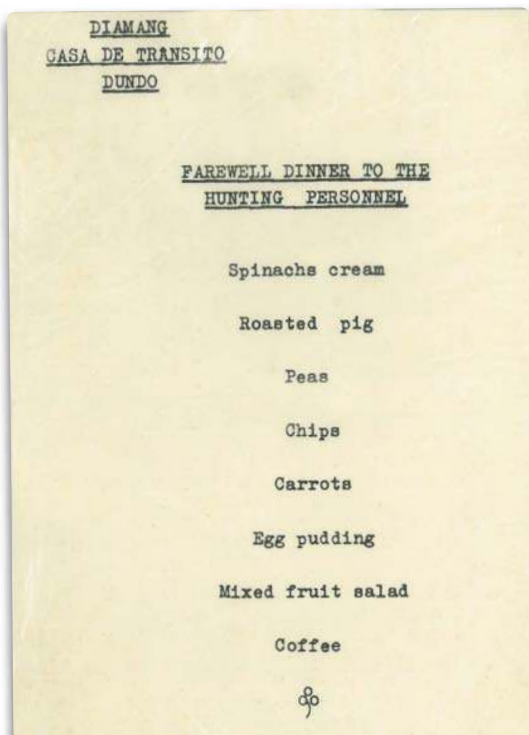
the fire was quickly extinguished and a safe landing made. Damage proved to be minimal, and we were soon back in the air.

Our base for most of the gold survey was to be Takoradi, a sleepy town on the coast about 100 miles (160km) west of Accra. Much quieter than the capital’s airport, Takoradi was better suited to our operation. Good flying weather gave momentum to the survey task. My logbook entry for June 1960 shows 117 flying hours; UK Ministry of Aviation flight-time limitations were then 120 flying hours per month.

MOVING ON

At the end of August a message arrived from Hunting requiring us to reposition without delay to Portuguese Angola (the Republic of Angola since independence in 1975). We were to complete a survey at an up-country diamond mine called Portugalia. Arriving in the capital, Luanda, on September 6, we learned that heavy fighting was taking place in the neighbouring Democratic Republic of the Congo, but had assurances that a detachment of Portuguese paratroops was guarding the area close to the Congo border.

The following day we flew north to the mine, arriving in less than 3hr. During the drive to our accommodation, whenever we passed locals walking on the clay road, they stopped, the men removed their hats and bowed their heads and the women and girls curtsied. We observed the same behaviour on subsequent journeys; I found this demeaning ritual somewhat disturbing.



LEFT *The menu for the farewell dinner laid on at Portugalia on September 22, 1960, during the author's three-week survey stay in Portuguese Angola. Starting with "Spinachs cream" and rounding off with "Egg pudding" and a mixed fruit salad, it was a meal fit for kings and a welcome change from the somewhat more rudimentary fare generally available during the African trip.* AUTHOR'S COLLECTION

During a brief tour of the mine, one of the few English-speaking employees showed us a large winding area of gravel, explaining that it was a riverbed that had been dammed, awaiting the removal of the gravel which contained the diamonds. The disclosure prompted several of us to get down on hands and knees and commence picking through the gravel. Our guide was beside himself, telling us that this was completely forbidden and would set a poor example to the local workers, who were looking on, stunned.

This was another survey blessed with good weather, so it was completed in 20 days without incident. Before departure, it appeared that our hosts had forgiven our earlier misdemeanour on the riverbed, as they treated us to a whole roast pig dinner before departure. Then it was time to get back to resume our gold survey in Ghana. Our return route was Portugalia—Luanda—Libreville (Gabon)—Calabar (Nigeria)—Accra. Here, Geoff Earlam left our group, replaced by Freddie Brown.

The operation now relocated to Tamale in Ghana's Northern Region. There, an experimental flight was undertaken in company with one of two Percival Princes then operating in the area with Hunting's associate French company, SAPA Paris. This entailed the Prince navigating and the DC-3 forming at a fixed distance behind, undertaken using a modified radar altimeter device. A second device displayed our height above surface level.

The photo line took us across Lake Bosumtwi,

a near-circular lake in an impact crater, five miles (8km) across and formed millions of years ago by a meteorite strike. Problems arose when, while we were following the Prince across the lake, the far side of the crater loomed to unachievable heights for the DC-3, which lacked the power/weight capabilities of the Prince. Despite applying maximum power as we approached the edge of the crater, it became clear that we would be unable to clear the top of the ridge. As a result, the run was abandoned and we turned away, picking up the Prince again only after a 360° climbing turn. Subsequently the experiment was halted permanently.

Within weeks of arriving in Tamale, I fell ill with malaria and was hallucinating. Admitted to a local hospital under the care of a huge but kindly Matron, I was flown out from Accra as walking wounded on a British United Airways Bristol Britannia, returning to the UK for recuperation. Happily, within a short time, I was back in the air once more, fully recovered.

LESSONS LEARNED?

Hunting was a good company to work for, and when the time came I was reluctant to move on. The previous two years had provided invaluable experience. My knowledge of the DC-3 had received an enormous boost and I had grown fond of the aircraft's quirks: the climb up the sloping floor to the cockpit; the waddling, nose-high taxiing attitude; the rattle from reduction gears when the engine was shut down after flight, followed by the "ping" of cooling metal as engine parts slowly contracted. But, with more than 60 per cent of my working life then being spent away from home, I was keen to lead a more settled married life.

Once again, I began perusing the back pages of *Flight* and *The Aeroplane*, thumbing through the "Sits Vac". When Jersey Airlines advertised for DC-3 copilots, I applied. On February 14, 1961, with some regret, I completed my last flight with Hunting, and my wife and I began preparations for a move to the Channel Islands (see *The Graveyard Shift*, TAH19).



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Dassault Mirage F1C serial 101, coded 30-MI, on display adjacent to the Normandie-Niemen Memorial Museum at Les Andelys in Normandy in June 2019. It is painted in markings celebrating the famous unit's 50th anniversary in 1992.




OFF THE BEATEN TRACK

PHOTOGRAPHS BY THE AUTHOR

*Ever turned a corner to find something unexpected? The Aviation Historian's intrepid aeronautical explorer **PETER DAVISON** investigates the stories behind the oddities that turn up in the most unusual places . . .*

NESTLED IN THE picturesque Seine Valley, the small town of Les Andelys in Normandy is a long way from any of the *Armée de l'Air*'s front-line fighter squadron bases. More famous as the birthplace of the 17th-century Baroque painter Nicolas Poussin, Les Andelys is nevertheless also home to the Normandie-Niemen Memorial Museum, with a Dassault Mirage F1C mounted at a dynamic angle on poles adjacent to the small museum.

The French fighter squadron known as Normandie-Niemen traces its roots back to 1942, when the Groupe de Chasse 3 "Normandie" was sent to the Eastern Front to fly Yakovlev fighters alongside the Soviets. After its participation in battles to liberate the Neman River in East Prussia in July 1944, the unit was awarded the battle honour to its name by Joseph Stalin, becoming the Normandie-Niemen Regiment.

The unit, famous for being the only Western Allied fighter group to fight with the Soviets until the end of the war in Europe, later went on to serve in Indochina and Algeria under various designations, but always with the illustrious moniker. The unit entered the jet age with the SNCASE Mistral (licence-built Vampire) and later flew the Vautour and Mirage F1C, hence the example (serial 101, coded 30-MI) at Les Andelys. After a dormant period during 2009–2011, the unit remains operational in 2020 with Dassault Rafales. 





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